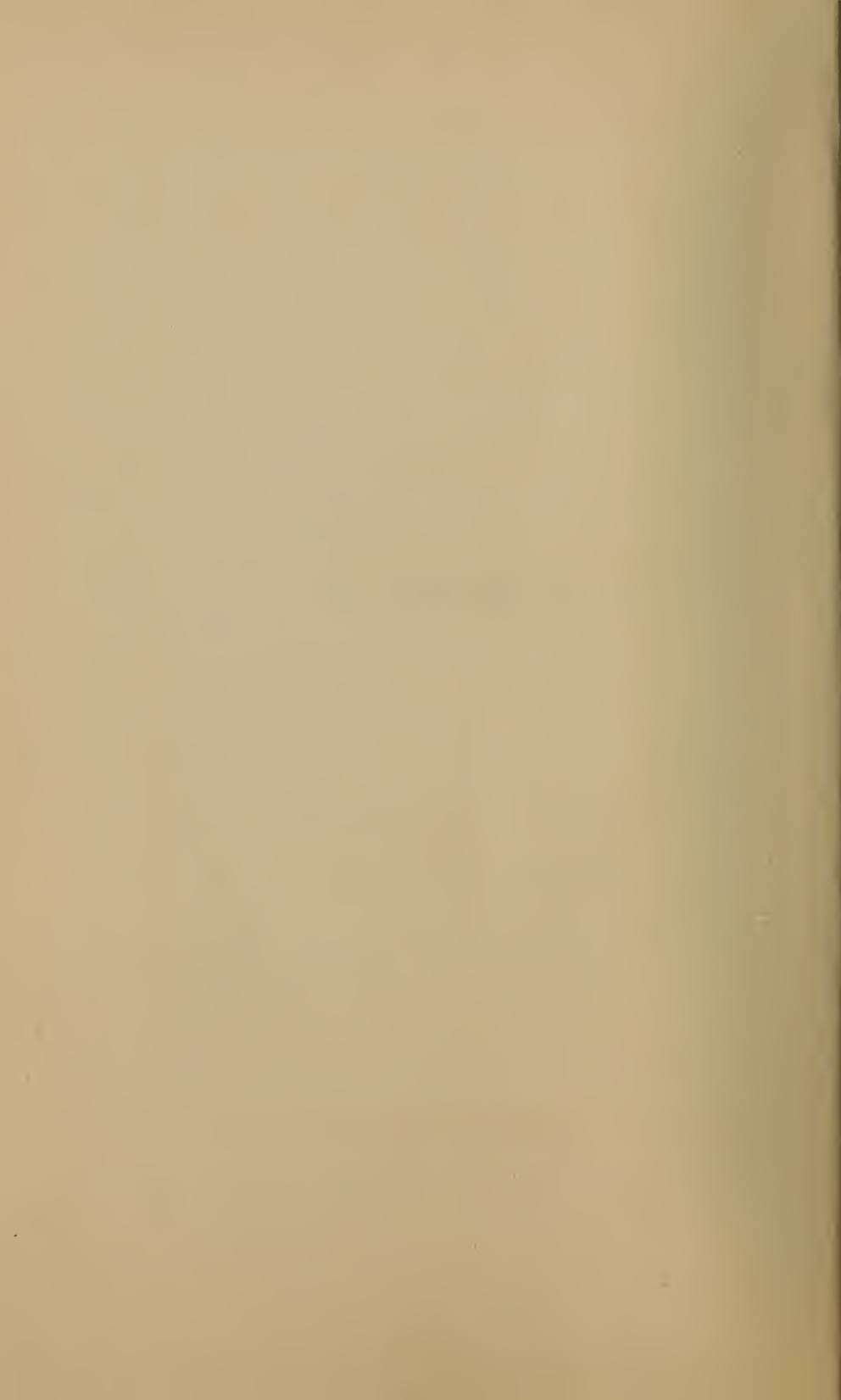




# C O S T S





# C O S T S

## Their Compilation and Use in Management

*By*

IRVING A. BERNDT

DIRECTOR, SOCIETY OF INDUSTRIAL ENGINEERS;  
ASSOCIATE, AMERICAN SOCIETY OF MECHANICAL ENGINEERS;  
MEMBER EDITORIAL BOARD OF 100%,  
THE EFFICIENCY MAGAZINE

*First Edition*



CHICAGO  
H. P. GOULD COMPANY

HF5686  
.C8B4

Copyright 1920 by H. P. Gould Company  
and subject matter taken in part from previous publications of  
H. P. Gould Company protected by Copyrights granted  
on the dates of former publications.

JUN - 7 1920

The Collegiate Press  
GEORGE BANTA PUBLISHING COMPANY  
MENASHA, WISCONSIN

© Cl. A 571232

no 1

To My Mother





## FOREWORD

This volume is dedicated to just two purposes.

First, to promote the most extensive use and application of Costs in management and production.

Second, to serve as a reference to those already using costs, suggesting standards by which they can test and measure their present methods and applications and determine whether or not their methods follow modern principles and philosophy, whether or not they are collecting usable data and, most important of all, whether or not they are using that which they do collect to the fullest extent possible.

It is not intended to be a "complete cost keeper." It does not offer a cut-and-dried, ready-made cost system. It is not a guide or reference to any one particular system of costing.

Much of the material included was written a number of years back in the form of separate articles published monthly in the pages of 100% *Magazine*. During this period the writer secured much valuable aid and inspiration from the interesting discussions at the editorial board meetings

of 100%, *The Efficiency Magazine* as arranged by Harold P. Gould, its Editor-in-chief, and wishes to acknowledge his indebtedness for this contact and influence. When it was assembled and edited the writer found very little necessity to change his opinions or conclusions and since it has had this test of time, feels justified in offering it in this form as a permanent reference.

The writer wishes to acknowledge his appreciation and indebtedness to Edward L. Ryerson, Jr., with whom he was associated during the periods when much of the original material was written, inasmuch as a great many of the opinions, conclusions and arguments were developed during the many interesting discussions of the subject with him.

Sincere acknowledgment is also recorded here to his present associates, Mr. C. E. Knoeppel and Mr. J. P. Jordan, for their constructively critical review of all the material contained herein in its present form.

IRVING A. BERNDT

## INTRODUCTION

The consequences of the World War have been felt in all phases of commercial life and the slogan of "production at any price" will continue to influence our ideas of relative values through a long period of reconstruction. With speed the predominating factor, extravagance has resulted to such a wholesale extent that a reaction must follow. Results will again more than ever before be determined by accurate cost comparisons.

Mr. Irving Berndt's treatment of this subject, with its clear analysis of the relationships between costs and successful scientific management, is a valuable contribution to the study of a problem so vitally important in this period of readjustments. The philosophy of cost accounting and its effectiveness in Executive Control, described by specific evidences, not by any particular system of cost keeping, should give the general executive or the cost accountant a new inspiration.

The trend of modern business toward the highest degree of efficiency requires exhaustive scientific analysis of causes and results which can only be obtained by a progressive and aggressive scheme of education of both employer and employee. The valuable use of cost keeping as described by Mr. Berndt has this idea as one of its principal motives and is the result of his successful application of this theory over a period of years when we were jointly interested in the development of this

work. His carefully worked out deductions have justified themselves in actual practice; they have grown more important and more clearly defined with use. With this background of successful application the author now presents them in this compact and illuminating treatise as a valuable aid in modern business methods.

Rather than a detailed description of cost finding we have here an interpretation of cost as related to the science of management and as a controlling influence upon both Capital and Labor. To emphasize the great importance of the relationship between analytical cost and management as affecting the employer and employee I can do no better than to quote Mr. Berndt as follows:

“Just so long as managers know little about true costs and fail to tell labor the little they do know, just so long will there be difficulty in securing the co-operative spirit. There must be established a more satisfactory common ground between Capital and Labor. They must learn to speak a common language of values, interpreted in terms of cost of productive effort and relation between performance and reward.”

This presentation of the subject of cost accounting gives the reader an understanding frequently lost sight of when illustrated only by a tabulation of figures and a collection of forms. Here is a scheme with a practical application and a significant message of real value.

EDWARD L. RYERSON, JR.



# CONTENTS

Chapter	Page
I. THE COST FACTOR IN MANAGEMENT .	17
Six Aids	18
II. COSTS DURING PROSPEROUS PERIODS .	22
Correct Organization Necessary	23
Tendency for Larger Waste	25
Standard Burden Rates	26
III. COSTS DURING DEPRESSIONS . . . .	27
Control and Reduction of Costs	29
Making Up Losses from the Outside	30
IV. CO-OPERATION ON COST METHODS . . .	32
Federal Trade Commission Reports	32
U. S. Government Co-operation	33
Depreciation Neglected	34
V. ELEMENTS OF COSTS . . . . .	36
Labor—Direct and Indirect	38
Material and Maintenance	39
General Expenses	39, 40
VI. LABOR COSTS . . . . .	41
Collection of Data	41
Necessity for Complete Records	44
Payroll Graph	44
VII. CLASSIFICATION OF DIRECT LABOR COSTS	46
Definition "Direct" and "Indirect"	46, 47
Eight Units for Classification	48
VIII. CLASSIFICATION OF INDIRECT LABOR COSTS . . . . .	49
Five Main Classes	50
Sub-Classification	51

Chapter	Page
IX. COLLECTION AND RECORDING OF LABOR COSTS . . . . .	54
Standard Instructions Essential	55
Use of Timing Devices	56
Methods of Reporting Elapsed Time	56, 57
Advantages of Timekeeping	58
X. PAY ROLL DISTRIBUTION . . . . .	59
Detailed Distribution Necessary	59
Check on Payroll	59
Tracing Errors	60
Daily Statement on Piece Workers	61
XI. DIRECT MATERIAL COSTS . . . . .	62
First Cost Plus Handling	63
Classification of Materials	64
Raw Materials in Large Quantities	65
Record of Materials Issued	65
Control of Purchases Promotes Economy	67
Inspection of Material Purchased	68
Waste Analysis	68
XII. INDIRECT MATERIAL COSTS . . . . .	70
Materials Used for Supervision	70
Maintenance, etc.	70
Methods of Distribution	71, 72
Requisitions for Withdrawals	73
Five General Divisions for Classification	74
Securing Co-operation to Reduce Costs	75
Executive Approval of Purchase Requisitions	76
XIII. BURDEN COSTS . . . . .	77
Ignorance as to Meaning	77
Important Work for Cost Accountant	78
XIV. BURDEN CLASSIFICATIONS . . . . .	80
Six Principal Expenses	80
Defining Burden and General Expense	81
Furnishing Cost Information to Workers	83

---

# C O N T E N T S

---

xiii

Chapter	Page
XV. FIXED CHARGES . . . . .	84
Items That Should Be Included	84
Classification of Terms	85
XVI. ADMINISTRATION AND SELLING EXPENSE	87
Charging to Departments	87
Comparisons to Detect Variations	88
Minimum Classifications	88
Analysis of Selling Expenses	89
XVII. INTEREST ON INVESTMENT CHARGED AS COST . . . . .	90
Two Strong Arguments, pro and con	90
An Interesting Public Debate	91
Court Decisions	94
Opinions of a Prominent Industrial Engineer	95
XVIII. INTEREST ON INVESTMENT TAKEN FROM PROFIT . . . . .	97
Mr. C. E. Knoepfel's Testimony on This Point before the Federal Trade Commission	97
Opinion of Mr. H. L. Gantt	99
XIX. DEPRECIATION . . . . .	101
Why Depreciation Is Misunderstood	101
Excess Profits Tax Forced Attention to Depre- ciation	102
Land and Buildings	103
Important Factors to be Considered	104
Two Methods Used in Charging Off	105
XX. BURDEN AND EXPENSE DISTRIBUTION .	107
Four Methods Used	108
XXI. PERCENTAGE TO DIRECT WAGE BURDEN DISTRIBUTION . . . . .	111
Description of Main Points of This Method	112
Weakness of Plan	113

Chapter	Page
XXII. DIRECT LABOR HOUR BURDEN DISTRIBUTION . . . . .	115
Application and Limitations	115, 116
Development of Standard Rate per Hour	116
Bonus Paid Foremen	117
XXIII. MACHINE HOUR BURDEN DISTRIBUTION —OLD PLAN . . . . .	118
Proportionate Differences in Burden Costs	118
Two Distribution Plans	119
Example of Primitive Machine Rate Plan	120
Troublesome Complications	121
XXIV. MACHINE HOUR BURDEN DISTRIBUTION —MODERN PLAN . . . . .	124
How It Is Applied	123, 124
Best Adapted for Continuous Operations	127
XXV. BURDEN DISTRIBUTION ON MATERIALS . . . . .	128
Popularity Due to Simplicity	128
An Important Advantage of the Plan	130
Where It Works Best	132
XXVI. CHOOSING THE BURDEN DISTRIBUTION PLAN . . . . .	133
Accuracy Tempered by Practicability	134
Two Fundamental Purposes	135
Summary of Plans	137
XXVII. COST DATA COLLECTION AND PREPARATION . . . . .	138
Use of Charts	139
Preparing Data in Advance	143
XXVIII. COST STATEMENTS AND RECORDS . . . . .	144
An Interesting Comparison	144
Making Cost Statements Inspirational	146
Valuable Data Not Used by Executives	147
Data for Comparison on Expense Items	148



---

# C O N T E N T S

---

xv

Chapter	Page
XXIX. GETTING STATEMENTS OUT ON TIME . . . . .	150
Eliminate Duplication in Collection of Data	151
Making Schedule and Chart	152
The Use of Mechanical Devices	154
XXX. SYMBOLS AS AN AID . . . . .	157
Mnemonic	157
Numerical or Alphabetical	158
Combination System	159
XXXI. GRAPHIC PRESENTATION . . . . .	161
Graphs Facilitate Comparisons	162
Obviating Disclosure of Actual Figures	163
Suggestions for Use of Graphs	164
XXXII. THE COST DEPARTMENT ORGANIZATION	166
Two Extremes to be Guarded Against	167
Availability of Data Important	168
XXXIII. THE COST ACCOUNTANT . . . . .	170
Necessary Qualifications	170-172
XXXIV. RELATION BETWEEN COST AND EFFICIENCY DEPARTMENTS . . . . .	173
Functions of These Two Departments	173
Distinction in Results Obtained	174
XXXV. USE OF COSTS FOR CONTROL . . . . .	176
Four Principal Uses of Cost Data	176
The "Why" of Some Business Failures	183
Estimating Production	184
XXXVI. USE OF COSTS FOR STANDARDIZATION . . . . .	188
Proper Appreciation	188
How to Start	190
Establishing and Maintaining Standards	192

Chapter	Page
XXXVII. USE OF COSTS FOR FINANCIAL PURPOSES	196
Three Special Purposes	196
The Effect of Investments on Costs	198
XXXVIII. USE OF COSTS FOR PRICING AND SALES	201
Haphazard Fixing of Prices	202
A Safeguard on Fluctuating Markets	203
A Duty to the Public	205
XXXIX. THE EFFECT OF COST DATA ON THE LABOR PROBLEM	208
A Definite Influence	208
An Important Factor in Making Decisions	209
The Worker's Reaction	212
XL. GETTING THE CO-OPERATIVE SPIRIT THROUGH COSTS	215
Education of Executives and Workers	215
The Dissemination of Cost Data Promotes Con- fidence	216
The Effect of Extravagant Management	218
XLI. FORMS	222
Forms Merely a Tool, Not a Cost System	223
Misapplication of Forms	223
When to Design Forms	224
Simplicity, Size and Shape Important	226
Standardization of Forms an Economy	228
XLII. COST TESTS	230
Two Factors to be Considered	231
When to Use Graphs	231
Standardization Facilitates Comparisons	234
Permanency the Essential Qualification	235

# C O S T S

## THEIR COMPILATION AND USE IN MANAGEMENT

### CHAPTER I

#### THE COST FACTOR IN MANAGEMENT

**A**LL industrial and commercial activities are based in the final analysis, on that one all-important act of man-decision. The manufacturer decides to produce a certain article and then at what price it shall be sold. He decides to use in its production certain commodities and, further, to manufacture it on certain machines. The dealer decides to sell a certain article at a certain price; the purchaser decides to buy it at that price. The employer decides to hire an individual and pay him a certain wage; the worker decides to work for him at that rate of wages. The storekeeper decides the amount of material to purchase and the proper time to buy it. Under scientific management we find the specialist who decides the exact methods to be followed in each operation in the production and distribution of the product.

No matter what is manufactured or sold, nor how, some one must make a decision at some time

affecting each act performed. The success of the business or industry depends upon how shrewdly, intelligently and carefully these decisions are made. Their effect is far-reaching. They make or break an organization or an individual.

Decisions are usually made with one of the six following aids:

- |               |                  |
|---------------|------------------|
| 1. Intuition  | 4. Snap Judgment |
| 2. Experience | 5. Habit         |
| 3. Impulse    | 6. Analysis      |

Intuition is defined as "complete and direct apprehension without reasoning." The fact that reasoning is not included in this action should alone point out its instability and unreliability as an aid in making decisions. It is certainly not dependable in these days of intensive business building when there is no time to wait for that psychic moment of intuitional inspiration.

Experience as an aid in making decisions would be satisfactory if the experience were always complete, detailed and accurate as to the point to be decided and all matters pertaining to it. It is valuable, therefore, only in the proportion that it completely meets these requirements. Experience is depended upon more than is necessary or wise in making decisions.

Impulsive decisions would be successful if the impulses were all in the right direction. It seems hardly necessary to point out that this is not true



in the majority of cases. The very nature of this method of deciding points makes it unreliable and therefore unsatisfactory.

Snap judgment is usually resorted to for want of time to consider carefully everything having a bearing on the point to be decided. Like many other things done in haste, it is often repented at leisure.

Making a decision in a certain way from habit may be wise, if the habitual method has proved to be the best in all circumstances. Here the danger lies in the fact that the best possible action may not have been discovered before the development of the habit. It is well at least to check up such habitual decisions from time to time to see whether or not there is room for improvement.

We now come to the sixth and last aid in making decisions—analysis. This is the most consistently effective and successful basis of them all. It includes the complete investigation of all information pertaining to the point in question, and all related points, and the thorough analysis of all data at hand. This data should be complete, detailed, accessible, accurate and up-to-date enough to be of assistance in making prompt decisions based upon a knowledge of previous conditions and possible future effects.

If the money losses in business caused by the employment of unintelligent and unreliable aids in making decisions were totaled in a lump sum, their amount would be staggering. There can be little

doubt that a great majority of the business failures reported by Bradstreet are traceable to this lack of investigation and analysis in deciding vital points.

Cost data, and particularly operating cost data, are a valuable aid in making decisions. There is hardly a decision made which is not directly or indirectly affected by costs and does not directly or indirectly affect costs in turn. A careful analysis of present and past cost conditions of any operation, item or factor in production should certainly assist by pointing out accurately, as nothing else can do, the effect of the continuation of present practices and policies, of a change in them or of the development of entirely new practices or policies.

Operating cost data are available for this purpose if they have been correctly collected and recorded.

We do not wish to be understood as advocating a new and complete investigation each time a decision, no matter how trivial, is made. We do insist, however, that all important decisions can best be made only after a careful analysis of all the information available.

Minor decisions, arising frequently, should be based upon general policies which have been determined periodically after the same careful and thorough investigation and analysis of available information. This determination of policies for guidance in making decisions is the real work of standardization which makes for efficiency.

We wish also to emphasize that no cost accounting plan is complete unless all information is collected and arranged so that it may be put to immediate use in making these decisions and determining these policies. The data collected must be complete and sufficient as to present and past practices, so that possible future results can be quickly and accurately estimated. This information need not all be tabulated currently in statement form, but it should always be available for easy tabulation when it is needed.

## CHAPTER II

### COSTS DURING PROSPEROUS PERIODS

**W**HEN the production of your plant under prosperous conditions seems to have reached its limit and you are asked what additional demand you can take care of during the next one, two or six months, are you in position to give an intelligent reply, based on facts and records of past performance which you know you can live up to?

When the acceptance of a large order involving a considerable margin of profit depends entirely on your statement as to whether or not you can make the necessary delivery, can you conscientiously and quickly make the decision, without feeling in the future, if you decide in the negative, that you may have unwisely turned away some very good business, or without feeling a gnawing worry, if you decide in the affirmative, as to how you are going to make good on a very hasty, although well-intentioned, promise?

When the question of more machinery, more equipment, more space or more buildings arises,

are you able to correctly and definitely decide how much and what kind of equipment you need and can work to the best advantage, or how much additional space can be advantageously used and what size and design of building will fill the new requirements? Can you do this with a certainty that these investments can be afforded; that you will be able to utilize them to such an extent that the depreciation and interest on the investments will be paid for in additional business, and that these items will not become an unearned burden in the future when business conditions are not so good? Do you know just how far you can go?

When your foreman wants more men, how do you know that he needs the number and kind he asks for? Are you sure just which sections need additional help? Do you know how many burden men can be added without making the burden top-heavy? Do you know whether or not it will pay to add to your organization?

If the source of supply of certain materials used in your production is temporarily or permanently stopped, and the use of substitute material will make necessary changes in processing which will affect your costs, can you readily tell just to what extent they will be affected?

It is, of course, understood that in order to make all these decisions wisely and intelligently, it is necessary to provide a correct organization, standardization of operations, methods, materials and equipment, and suitable and sufficient equipment



and facilities, but we wish to suggest that all these are not enough without adequate and complete operating cost statements.

We would suggest that this prosperous condition of a business offers many temptations to the executive in charge, not only to disregard the assistance offered him by cost statements, but to believe them a hindrance.

He is being pressed for more production. The sales department cries: "Get out more work. We can sell it." Profits are large, at least larger than they were, and the policy very easily resolves itself into one of "production at any price." The executive may be so busy following the many other important details of his plant necessary for this increased business, that he may soon believe that the cost statements which are laid on his desk are a nuisance, and barely looks at them. His more important work is to get men and buildings, buy more machinery and increase the capacity of his plant generally. In other words he is extremely busy spending money.

Several striking lessons which can be learned from such conditions will prove that the use of operating cost data is more necessary and valuable than ever before, and that it is good business.

In the first place, why should any good business organization be willing to let any portion of these extra profits during profitable times be wasted? Such money should be conserved in a fund to carry the business over periods when business is poor



and profits small or not there at all. Not to do so is to class oneself with the man who, when money is plentiful, when he is "flush" in other words, extravagantly throws his money away for unnecessary things which probably do him more harm than good. Yet there is a striking resemblance to this case when, under prosperous conditions, a business dissipates its extra profits in wastes which would be unnecessary if someone in the organization took the interest and the time to watch each expenditure as carefully as it would be watched were conditions not so good and were economy the order of the day.

This extravagance in expenditure becomes a habit with a business organization and tends to demoralize it just as readily as it does an individual. Its ill effects will be felt long after the prosperous periods have come to an end, and especially when depressions come.

Another point to be remembered is that as the operating expenses for labor, burden and supplies legitimately increase there is opportunity for greater total amounts—as well as a tendency for a larger percentage of waste to expense—to be wasted, or saved by careful use of costs.

When such conditions occur and a great deal of energy is exerted in spending money, there should be a strong element in the organization at work studying all factors, with the idea of saving a part of it and eliminating inefficiencies. This influence should be stronger, if anything, than ever before,

and might be brought to bear through additional executive control or through a betterment or efficiency manager or staff.

Cost statements should, if anything, be more promptly available for study and analysis. They should be studied with more interest, since they represent larger expenditures made under more difficult conditions.

The application of the principle of standard normal burden rates offers particular advantages during prosperous periods. If burden rates have been established and charged as they should be on a basis of normal operation, and the burden is properly watched and kept down with the aid of detailed cost statements, the results should of course be, with an increase in the number of units produced, a larger total of burden accounted for than is actually spent. This surplus, actually a profit, should be kept as a reserve to make up for deficits under less prosperous conditions.

In this way a more stable basis of operation is established and a record is provided which will serve to indicate how successfully the management is watching the rise and fall of burden expenses in proportion to production and earnings.

## CHAPTER III

### COSTS DURING DEPRESSIONS

WHEN the demand for production decreases, direct production costs can be decreased, to a certain extent at least, in proportion to production requirement. Materials need not be purchased unless the product for which they are intended can be sold. Workmen need not be employed unless there is reasonable assurance that their production will be disposed of. But what of the majority of items of burden expenses? Can they be decreased? How shall we take care of idle machinery?

If burden cannot be decreased, and relentlessly continues regardless of the amount of production, it becomes an ever-increasing proportion of the total cost and usually a higher unit cost is the result. The total burden must be charged to something, and if the number of units manufactured is smaller, each unit must carry a larger amount of the total burden. To increase the cost and necessarily the price is, of course, very undesirable, especially at a time such as we are considering, when it is difficult enough to secure

business at the original prices. And so the problem becomes more and more complicated.

Complicated as this problem is to the company that knows exactly what effect decreased production and sales have on its costs, how much more complicated must it be to those companies which do not know accurately the amount of their burden, how it is classified, its proportion to direct costs and to units produced; those companies which, in short, have no dependable cost data. There remains nothing for them to do but to take chances in the dark.

Is it, then, surprising that so many disasters occur when such concerns attempt without chart or compass to sail the troubled sea of business upon which even the best equipped business bark finds it difficult to navigate?

The least an industrial organization should do under such business conditions is to positively ascertain whether or not its cost data are accurate, what total burden is carried, of what items it consists, how it is distributed, and whether or not its plan of burden distribution is the best available.

There is no doubt that a period of business depression puts a method of burden distribution to a most severe test. This is proper because, as we suggested before, it becomes an especially important factor. We regret, however, that the tendency of many executives is either to neglect to refer to a plan of distribution or to brand it as inaccurate merely because it tells facts which are

unwelcome. Herein should lie its value—that it does tell the facts.

We believe there is a tendency among many managers and executives to fail to recognize sufficiently that there are at least two fundamental purposes in collecting cost data, and especially burden expenses. These fundamental purposes are:

1. The control and reduction of costs
2. The study of price.

First of all, cost data should tell true costs and should not be used for setting selling prices until they do so.

If these two purposes of making burden distributions are recognized, we should above all be honest with ourselves and should not attempt to disregard or change a method which tells the truth under prosperous conditions, just because we find under less prosperous conditions that that truth is unwelcome. If the method is right and serves these purposes under any condition, it should be right under all conditions; otherwise it is not standing the test.

Therefore, let us have truth first, and under all conditions let there be no variance from the method which tells the truth merely to make matters seem more agreeable on the surface. We should, if anything, study it all the harder because it gives us correct information, and should make



every possible use of it in keeping costs down and prices right.

To set the selling price it is of course necessary to consider many other factors beside the cost. In setting this price under various conditions of the trade, study is needed and good judgment must be exercised. Having a true cost, which is unvaryingly accurate, we at least know in setting the selling price when we are taking chances of loss.

The correct method must, therefore, give true cost under all conditions so that it designates immediately and exactly the loss or profit at any price we set. It must never allow us to juggle the figures so that they seem to show anything we want them to show.

There is another lesson to be drawn from strained business and trade conditions. Too often do many companies increase prices to take care of increased unit burden costs when a study of this burden and the items that go to make it up would point out possible reductions in its total and make such increases in price unnecessary. In other words, they try to make up losses from the outside rather than from the inside. An internal study should be made first, and here again the burden classification and distribution, if they are properly made, become very important and valuable.

If an internal study were consistently made, losses during poor business seasons might be made up by extra profits during good seasons when operating under the decreased burden total

brought about by the "house cleaning" such study developed.

In other words, if proper advantage were taken of the extensive study which should go hand in hand with periods of business depressions to decrease operating costs, such periods might become valuable rather than destructive, teaching a lesson which, if properly accepted, would permit the reaping of greater profits under normal business and trade conditions.

As indicated in the last chapter, the application of burden rates established on a basis of normal operation and applied under all conditions, serves to provide a reserve after a period of greater production, to make up for deficits in burden earned occurring during less prosperous conditions, and in this way provides a more stable basis for operation.

However, the existence of this reserve is no excuse for any less energetic study of burden reduction, since it really represents profit so long as it is not absorbed during dull periods. The period of depression should take care of itself as long as possible, with resort to a reserve established during prosperous times only as a final expediency in order to keep conditions stable.



## CHAPTER IV

### CO-OPERATION ON COST METHODS

**T**HERE is certainly great significance in the statements of Edward N. Hurley, formerly chairman of the Federal Trade Commission, when he addressed the Ohio Bankers' Association at Columbus, and, among other things, recommended that one of the most important means of strengthening American industry to meet European competition after the war was the establishment of cost systems.

Mr. Hurley stated that nine-tenths of the concerns reporting to the Federal Trade Commission do not keep adequate cost systems and that fully one-half of the 60,000 corporations that report an annual income of \$5,000 or over, do not charge off a single penny for depreciation.

He said also that the Trade Commission was prepared to send experts to assist trade associations in adopting sound systems.

These statements are important: first, because both certainly indicate the need of attention to this phase of executive control, and second, and

more especially, because the last statement offers a definite solution.

It is a long step forward when the United States Government prepares itself to co-operate with industry in groups in such a matter as the standardization of cost methods. It will be a still greater step forward when industry prepares itself to accept this assistance from the Government.

The greatest good will result from the general consideration of this matter by groups in each industry. In that way one company will assist another, and, finally, allied groups will co-operate with one another.

The one thing which will retard the advance of this movement is, no doubt, a misunderstanding of the results to be obtained.

Many executives and companies may hesitate to join in this study of cost methods through a feeling that a study of costs must include a consideration of actual cost figures, which they would not be ready to divulge.

This is entirely unnecessary; first, because standard methods and systems cannot in any case be based upon figures, but must be the result of logical conclusions based upon experience and the development of principles; and second, because it will be noted that Mr. Hurley emphasizes systems and methods. It is, of course, obvious that a government, the legislation of which forbids it, could not encourage price fixing in any sense.

We are hoping that manufacturers will study

this phase of cost accounting with an appreciation that cost finding and price determination are two separate, distinct functions, the first being merely a basis for the second. Further, that cost methods and actual cost figures are entirely separable, the latter being merely the result of the execution of the plan outlined in the former.

It is in the development of this basis for securing cost figures that the co-operation of industrial groups will be so valuable.

Take for instance depreciation, which as Mr. Hurley pointed out, is so much neglected: there can be no doubt as to the value of the discussion and consideration of this cost factor in a given industry.

The discussion of depreciation must be based upon certain experience; the greater the experience available, the more intelligent will be the decision.

The information to be desired will be not how much Wm. Brown & Co. charge per unit for depreciation, but first, whether or not it is correct to include depreciation as a portion of costs; second, on what kinds of equipment, building, etc., it should be figured; and lastly, from the combined experience of the members, what rates of depreciation are advisable under various conditions.

In addition to this, there are several different methods of charging depreciation, only one of which can be absolutely correct, and it is here that not only members of a group, but groups as well, can co-operate.

After all these points have been decided upon and each manufacturer has based his costs on correct methods, we venture to suggest that there will still be ample opportunity for competition, but it will be a fair competition, an intelligent competition, and, what we need above all in these United States, a co-operative competition.

We sincerely hope that manufacturers will accept this opportunity to help themselves and each other, and that the plans outlined by Mr. Hurley may meet with unqualified success.

## CHAPTER V

### ELEMENTS OF COSTS

**E**FFICIENCY in its broadest sense is defined as the ratio of results obtained to effort expended. Efficiency in its relation to industrial enterprises may be defined, then, as the ratio of production to dollars expended—dollars representing wages for labor, cost of material and equipment and all other necessary expenditures.

Science represents knowledge duly arranged and systematized, and it follows that the science of management must include a complete, accurate and systematically arranged knowledge of the efficiency of each dollar spent.

Like all other sciences it is not complete without a record of analysis, and a complete and permanent record of results of experiments and the effects of all varying conditions and changes.

In the same manner that the science of chemistry analyzes chemicals and their uses, and then prescribes correct combinations for most efficient use, so must the science of management analyze the use of dollars and prescribe methods for their most efficient use.

To fill the need for such records, to give to the student of scientific management such methods of analysis, and to provide a permanent record of experiments and research for future guidance, we must have cost statements, records and data.

It was not so long ago that operating cost statements were considered a luxury. Hard work, long hours, shrewd bargaining and judgment spelled success. In these days of intensive competition, however, this definition has been changed; judgment has been largely replaced by scientific analysis and cost records.

Operating cost statements are receiving ever-increasing attention. They now have a recognized value, and will soon be considered indispensable.

To a failing business they represent a new lease on life, pointing out possible retrenchments which would never have appeared without them. To a prosperous business they constitute a protection, warning the management of dangerous policies and practices. For the investor and the executive they provide a course by which to steer their business bark. They insure employees, from the manager down, absolute justice and fair dealing, inasmuch as snap judgment is replaced by scientific analysis, and permanent and accurate records of efficiencies, individually and as a body. On account of their importance in the work of waste reduction they help give the consumer and the public at large greater dollar efficiency.

To manufacture any product we must incur



expenses which may be described as labor, material and overhead. As one of the great purposes of an operating cost system is to compare costs, it is vitally important that an analysis be made of every expense to decide its correct place in a comparative statement and to insure a fair comparison made on exactly the same basis each day, week, month or period.

The importance of this analysis cannot be overestimated. It is the survey from which is planned the foundation of the cost statement, and if it is incorrect, incomplete or ambiguous, it will lead to innumerable troubles.

Labor cost is divided into two classes—productive, or that spent in actually making the product, and non-productive, or that which, although it does not actually produce, is necessary for the supervision, housing, maintenance and efficiency of the labor which does produce. The former should be termed direct labor; the latter indirect labor.

In the first class is placed the machine hand, who produces so many parts each day; the bench hand, who turns out so many pieces an hour; or the floor hand, who spends days assembling one complete machine or bridge.

In the second class are foremen, crane, hoist or derrick operators, tool room attendants, repairmen, etc.

In the analysis of material cost we again find two classes. One class, which we will call direct mate-



rial, should contain such material as is used in the manufacture of the product. The other class, which we will call indirect material, should contain such material as is used to assist in the manufacture but does not actually go into the product.

In the former is placed the casting which is used in making the finished machine or part, the steel beam used in making the bridge, or the wood used in making the table.

In the latter class are placed items used in repairing, renewing or maintaining machinery and buildings, such as new parts, oils, grease, fuel, light globes, crayons, paints for marking and stenciling parts.

In analyzing overhead we have indirect labor, indirect material and a number of other expenses such as rent, taxes, insurance, depreciation, etc. In order to facilitate our comparisons, these expenses should be classified according to two divisions: burden and general expenses.

Under burden we should have burden labor and burden material, directly chargeable to manufacturing, both items controlled by the departmental foremen or superintendents, also all fixed charges, such as depreciation, rent, insurance, which can be directly charged to the plant departments or divisions.

The classification of burden is a large study in itself and will be considered more fully later on.

General expenses should include such items of administration, rent, insurance and fixed charges,

as cannot be carried directly to the individual departments or divisions.

It would be impossible to make a classification of expenses that would cover all cases, owing to the fact that conditions of manufacture have a bearing on the correct division of expenses. While some items may be classified in a certain division in one plant, they may be thrown into a different one when studying another case. The classification, then, must be original and individual to a certain extent in each analysis.

## CHAPTER VI

### LABOR COSTS

**T**HE WORLD holds no greater resource than productive labor, be it manual or mental, and yet, in proportion to its value, amazingly little is known about it. It would be difficult to imagine any product or material that does not necessitate the use of labor at some time or another up to the time of its ultimate consumption or use, yet here again there is a deplorable lack of knowledge as to the proportionate amount of labor necessary in the production and distribution of this material or product. All of which is simply another argument in favor of the collection, recording and study of data on labor and its relation to production, in order that it may be conserved and used to its greatest efficiency.

At the beginning of the scientific study of production, the need for definite and accurate records of labor spent was quickly recognized. Hence we have the carefully collected labor records and data, which, after all, have been developed with

only the best ultimate intentions toward labor for its conservation and most effective use.

Labor costs are important then, if for no other reason than that in almost every instance very little is really known of the relation between the amount spent and the value of the work performed. This problem has by no means been successfully solved. Unless it comes as a result of the work done by George DeA. Babcock, in the development of his formula for arriving at the value per hour of labor performed by various workers under different conditions, we know of no rule which can be applied in each and every case to tell us what our labor costs should be and will be under various changing conditions of business.

Even in the highly standardized organizations, and there are at present proportionately few such, where standards have been established covering all direct or what is commonly known as productive labor and where the cost of increased production can be estimated more or less correctly by the application of these standards, there still remains the problem of indirect or burden labor.

How much is required and will be required as production is increased? Can the present foreman or supervising organization handle another group of workmen? Equipment upkeep will increase as the machines are operated more hours per day. But how much? Or new machines may be added which will require extra attention and upkeep. As business improves and production increases, the

factory floors or store rooms may become congested and the moving and transferring of material may become a difficult problem. More men will be required to do this work. But how many?

Such are the questions which the executive of a highly standardized plant must answer when under prosperous business conditions and in order to take care of greatly increased production requirements, he must look ahead and make arrangements to increase his working force.

And the number of these questions is multiplied two- and three-fold when there are no standards, and every labor hour is an unknown quantity varying in value with the man, machine, operation, and what not.

Of course, there is an easy solution, the line of least resistance—to hire more men: to maintain a force plenty large enough for peak requirements even though some men are idle part of the time or are entirely unnecessary. The sales and administrative departments of the organization are optimistic and suggest getting and holding plenty of men.

But is this solution entirely fair? Certainly it is unfair to the workman if he is retained only to waste part or all of his time and is to be dropped again just as soon as production requirements drop. The aim should be to give all men continuous employment in positions where they can make themselves most valuable and receive the largest return for their services. We venture the statement that there is productive work enough for all the men in

this country to do if only they were properly distributed, and working on the jobs for which they were best suited or to which they could be trained through continuous employment.

Obviously this method of taking care of labor problems is unfair to the company if it results in the waste of time for which good money is being paid. Much more might be written here of the inefficiencies of organizations with ever-changing personnel, and the promiscuous hiring and firing of men.

When considering this problem of labor and labor costs, the least we can suggest for guidance of the executive are complete records of operating costs on all classes of labor, including direct or what is commonly called productive labor, as well as indirect or burden labor. They should cover as many different conditions as possible and should be classified completely enough so that the executive could assume such hypothetical conditions as the future might bring, and estimate what labor costs would result from the various alternative solutions which he might apply. Even where standards have been developed, such records should be available to show whether or not the standards had been attained and maintained under various conditions.

If a graph is drawn showing by one line the increase and decrease of payrolls, and by another line the increase and decrease of production, unless it is in a period of standardization, usually it will



be found that the payroll line increases more rapidly than the production line and decreases more slowly. This is, of course, logical and necessary to a certain extent, but the nearer these two lines can be kept parallel, the better. A chart of this kind may be found of interest to many an executive.



## CHAPTER VII

### CLASSIFICATION OF DIRECT LABOR COSTS

**A**LL EXPENDITURES of labor are divided into two broad and natural classifications.

The first contains all labor items covering work done to produce, construct or handle salable products and materials, the nature and manner of handling of which is such as to make it possible to measure and record it accurately and definitely against the recognized and satisfactory units of manufacture or sale of the products or materials to which it applies. These units represent either time, or materials, or combinations of these two.

The second class contains all items covering work which is not definitely measurable against the above mentioned units, being necessary for production only in relation to direct effort, and covering, as it should, the supervision, housing, maintenance and efficiency of that labor as a whole.

These two classes are often described as productive and non-productive respectively. This terminology is misleading, since all activities to become labor must be productive, and labor des-

cribed as belonging to the second class is after all every bit as productive as that in the first class. A better description will be found in the names "direct" and "indirect," inasmuch as the labor specified in the first class may be charged directly to production, and that in the second class but indirectly.

Direct labor may be described as the labor which is accurately and definitely measurable against the recognized units of the product or material to which it applies. In classifying and recording this labor, the first step is to describe just what these units are to be. It might be well to suggest here that the more minute the units recorded, the more useful the record. The most useful record would be one which showed the exact labor expended in each move of a given corporation on a product, exactly as is done in time and motion study. This is, of course, impractical as a permanent detail, as they can be recorded only at intervals in the same motion study. Units must be found, then, which are small enough to be properly descriptive and useful, and on which the time expended is long enough to make it practical, with an allowable amount of detail work to record it accurately.

In the following list will be found eight different headings under which direct labor is usually classified. It is almost always necessary to collect data according to several of them, and in

many cases it may be desirable to use them all. These eight units are:

1. Men
2. Operations
3. Machines
4. Materials or Products
5. Departments or Divisions
6. Orders or Contracts
7. Units of Commodity
8. Lots of Commodity.

In deciding upon this most important point it will be well to keep in mind the five most important uses of the records which are to be made as follows:

- |               |                          |
|---------------|--------------------------|
| 1. Control    | 4. Determining Standards |
| 2. Decisions  | 5. Future Estimates.     |
| 3. Reductions |                          |

We have then two kinds of labor, direct and indirect, measurable against either material or product used or service provided, in terms of hours. For analysis and use we have eight possible headings under which to classify direct labor, and in establishing our classifications, we should satisfy five possible uses of the data.

Here we have a combination of factors and variables worthy of much study before the final classification is established. It should not be passed over lightly. This classification is usually the very foundation of the entire cost plan.

## CHAPTER VIII

### CLASSIFICATION OF INDIRECT LABOR COSTS

WE HAVE described indirect labor as that which is not definitely or accurately measurable against the satisfactory and recognized units of manufacture or sale of the products or materials to which it applies, but which is necessary for production only in relation to direct effort, and covers the supervision, housing, maintenance and efficiency of that labor.

The very nature of direct labor makes indispensable in all cases some more or less complete classifications, even where no attempt is made to analyze the results or use them for other than absolutely necessary purposes. For instance, it is nearly always necessary to classify this labor against materials, products, operations, orders or contracts in order to determine prices, make estimates, or pay premium or piece rates. Unfortunately this is not true of indirect labor, inasmuch as it is usually added as a total lump sum percentage.

Classifications of indirect labor are usually considered unnecessary until an analysis and study of

it is commenced for reduction, decision or control. When it is considered, however, that indirect labor may, and usually does, amount in total to as much as direct labor, often to twice or three times as much, it will be readily seen that the classification, study and analysis of this expense should begin as soon as that of direct labor.

A logical consideration of just which items of labor expense make up the indirect labor total will readily suggest at least a general or main classification.

First, we find that class which is necessary for the education, discipline, efficiency, safety and supervision of direct labor. This gives us our main classification—Supervision.

Second, there is the class of labor necessary to serve the direct workers, supplying assistance in moving materials and the like. Here we have our second classification—Service.

Third, it is usually necessary, although there may be exceptions, to expend some labor installing and maintaining heating, lighting and power equipment. This provides the third main classification—Heat, Light and Power.

Fourth, machines, equipment and tools will require a maintenance, repairs and renewals. Here is found a fourth main classification—Maintenance.

Fifth, it is often found necessary, under certain conditions, to expend labor on the maintenance, repairs and upkeep of the buildings and grounds in

which the labor or plant is housed and located. Where this is true, a fourth main classification is provided—Rent.

We have, then, five main classifications of indirect labor as follows:

1. Supervision
2. Service
3. Heat, Light and Power
4. Maintenance
5. Rent.

A further classification and subdivision of these five main classifications depends entirely on local conditions, and it is possible here only to suggest some such subdivisions which might be found under ordinary circumstances and arranged for.

Under the first main division, Supervision, further subdivisions may be arranged for to cover items such as: Superintendents or foremen, bonus when paid for on an average efficiency basis, safety workers, timekeepers, and inspectors.

Under the second classification, Service, classifications can be made further to cover crane or derrick operators, transfer and move men, elevator operators and watchmen.

The third main classification, Heat, Light and Power, can be subdivided to cover engineers, firemen, coal unloaders, wire and line electricians.

Under the fourth main classification, Maintenance, can be placed maintenance labor, or oiling



and wiping, repairs or renewals and tool room charges.

The fifth main division, Rent, might be arranged to provide subdivisions for building repair men, porters, window cleaners, etc.

It will always be found best to localize and classify indirect labor further against departments or divisions, against machines or equipment, operations or commodity.

The chief control of indirect labor expense will be secured from comparisons. It is absolutely essential, therefore, that a definite division or classification be made for each and every item of this expense and that once having been made, it be allowed to remain in this division as long as possible.

Valuable comparisons cannot be secured if an item is charged to one account one month and to another the next. To guard against this, written instructions should be provided describing the classifications of this expense, and showing to which of these classifications the various kinds of indirect labor are chargeable.

In collecting and recording indirect labor items, it will be found desirable to provide mnemonic or suggestive symbols for each classification or account and to collect and record these items against such symbols in exactly the same manner as direct labor is collected and recorded against its units or divisions.

It may be found necessary in some cases to make

certain arbitrary distributions of some items of indirect labor, where it is impossible to record them otherwise. This practice should be avoided as much as possible, and whenever necessary should be done with only the best study, judgment and counsel, and when finally arranged for should be clearly defined in written instructions.

## CHAPTER IX

### COLLECTION AND RECORDING OF LABOR COSTS

**A**NY METHOD, system or device used in the collection and recording of labor costs to obtain the best results must be:

1. Accurate as to records furnished
2. Immediate and prompt in performance
3. Simple in operation
4. Definite in action
5. Rapid in execution.

In devising and developing a system of recording operating cost data, the first consideration should be accuracy. When accuracy has been assured, all other features may be worked out. In no case should accuracy be allowed to give place to or be allowed to suffer on account of any of the other essentials mentioned. Labor cost is usually used as a basis for other distributions and for this reason, if for no other, must be especially accurate.

This is by no means an easy matter in all cases. There are conditions under which all other data are correctly recorded by very good bookkeeping,

accounting and stores systems, but under which the labor cost figures, used as a basis for charging these data, are found to be uncertain and indefinite.

All records of labor operation should be made promptly and immediately after they occur. Memory should never be depended upon for these records, as it will be incorrect in the majority of cases. The sooner the record is available after the operation is performed the more easily, productively and satisfactorily it can be studied.

Simplicity will do much toward insuring accuracy. It will make the work more easily understood, and will reduce the cost of the labor involved in collecting these records. As many details should be eliminated as possible.

Every detail necessary to this work should be clearly defined as to action and meaning, so as to minimize misunderstandings and confusion, and leave as little as possible to individual judgment. Standard instructions should be written covering the methods to be used after they have been developed. These will be useful for reference.

A periodical check or audit should also be made to ascertain whether or not these instructions are being followed. It is surprising to note how easily and rapidly little changes, usually with bad effects, will unconsciously be made in the routine of this work.

The execution of the work should be rapid, and it will be if it is immediately and promptly done by simple and clearly defined methods.

Conditions vary. Consequently the correct method will vary. No one system can be said to suit all cases. There are, however, certain practices which may be considered unsatisfactory in all cases, a few of which will be described.

No attempt will be made to discuss here the many different mechanical devices that are used in connection with this work. They are no doubt helpful and should be used wherever required.

Perhaps the most universally used and safest method to secure a check on labor costs is to make two records, one showing the total daily hours of each man, and the other distributing these hours according to orders, operations and the various classifications desired. These two records should, of course, check one against the other.

The first record has been made by various check systems controlled by timekeepers, but so many satisfactory mechanical and electrical time clocks have been developed that at present the majority of such records are made by each workman himself on a clock, and afterward calculated by clerks who use this record for checking purposes.

A great diversity is noticed, however, in the methods employed to make the second and possibly the most important record which distributes the labor paid for to the various classifications desired. Some of the methods used are:

1. To have the workmen write a report at the end of the day or week.
2. To have foremen make such report.

3. To employ a timekeeper who goes to the various men and secures a record of operations from them.

4. To have the workmen record the time on a time clock or stamp in a centrally located office or at a desk.

5. To have the workmen report in a centrally located office each time they change their work to a clerk whose duty it is to make all necessary records, either with or without the aid of timing devices.

To ask a man to remember and report on his work and division of time after a week or even a day has elapsed, at once invites numerous inaccuracies and produces a very uncertain record. Even if a man's memory is good, he seldom knows the importance of the record and cannot be blamed if it is incorrect. It requires much of his time to keep account of his many changes, and allows a certain amount of "fixing" of this report of his efficiency to creep in if he is so inclined.

The foreman reporting the time of an average number of men will spend so much time doing it (and it is generally impossible to do it accurately unless he does devote considerable time to it) that much of the value of his work as a supervisor and educator is lost. In addition to this, he is doing work which can certainly be done as well or even better by a clerk at a much lower salary.

A timekeeper going to the workmen, unless to a small number whose work is confined to a small



area, will find it impossible to record all their changes of work and operations as accurately as they should be recorded, inasmuch as he must still depend to a certain extent upon reports from the various workmen.

The last two methods in our list and more especially the last, have been found to be satisfactory, not only for accuracy in recording the various changes of work, but because of the fact that the record secured can be promptly used in developing the dispatching and routing of work in a plant.

Where the last method is used, it has often been found desirable to make more than one copy of each record, and when the record is complete to use these various copies simultaneously for as many different necessary purposes as there are copies, thus securing immediately and promptly a maximum of information ready for use.

## CHAPTER X

### PAYROLL DISTRIBUTION

**M**ANY EMPLOYERS who pay out large sums of money for wages demand a careful check on the method of drawing out, recording, posting and paying these sums. These same employers, however, have an indifferent audit or check on the way the money is actually spent by the foreman or superintendent, of the amount of labor paid for, or the value received for it.

Just as long as money is held in the form of currency or securities, it seems to be considered necessary to watch it carefully. Why should it become less valuable when invested in labor?

The executive entrusting the cashier with \$100 to spend for sundries insists on the best possible accounting for every cent. At the same time he gives his superintendent \$10,000 to spend for labor and accepts a mediocre report of its use.

One of the things necessary for a correct accounting in wages is an accurate and detailed payroll distribution made as soon as possible after the labor is used. It should not be necessary to wait until after it is paid for. It seems hardly necessary

to mention the many cases where it is found difficult to account for from two to five per cent of the total payroll paid. Almost all large wage payers have encountered this trouble at one time or another.

A cause of this difficulty is found in the method of making a check and distribution after a month's time, or even a longer period. The errors or differences cannot be traced in many of these cases because no one has time to devote to the large amount of work it would require, and because, besides, the various transactions have become ancient history. The difference is usually charged to some item which is found lower than usual, or to some large item where it will not be noticed.

The daily check, then, is the remedy. For this a good recording clock or check system is necessary to record total daily hours work, as well as an equally sure and accurate individual operation or job time report.

Ordinarily, to secure a daily check, the great difficulty lies in the large amount of work involved in extending daily the total payroll of dollars and cents due to the ever changing conditions in force. The following suggests a simplified method of securing the daily payroll:

A standard payroll based on all workmen on the payroll working for the standard number of hours a day is computed. To keep this standard it is necessary to add promptly all wages paid to new men or given as increases in rates, and to deduct

promptly wages of all men dropped from the payroll. To secure a certain day's exact payroll, it is necessary simply to add to the standard payroll all amounts payable for extra or overtime work, and to deduct amounts covering late, lost or absent hours—in other words to compute the exceptions only.

In cases where piece rates are used, many plants have found it decidedly advantageous to provide a daily statement comparing daily average hourly wages earned with standards or normal earnings and pointing out significant exceptions either high or low.

The up-to-date executive will find a daily distribution an invaluable aid in reducing costs, inasmuch as it gives him an immediate accounting of any unnatural occurrences which can be investigated and remedied before they have gone far.

## CHAPTER XI

### DIRECT MATERIAL COSTS

**F**ROM THE time materials or products are found in their original condition as made by Nature, up to the time when they are consumed or put to their ultimate proper and most profitable use, every change, either in physical condition or location, is an exhibition and measurement of man's efforts, efficiency and skill. If for no other reason than to aid in the conservation and development of these efforts, this efficiency and this skill, all accurate knowledge possible should be obtained and accumulated as to the proportionate cost and value of such changes.

How many managers realize the innumerable changes which are occurring daily, in fact, hourly, in the cost and value of the materials which they handle, store or manufacture? When we remember that from the very moment the material is purchased, even before it is actually received, up to the time when it is sold and shipped, the cost is steadily increasing, and the value either increasing or decreasing, then we may partially realize how interesting and valuable a knowledge of the exact

amounts and proportionate value of these increases and decreases may be.

When material is purchased, new costs are added immediately to the original purchase price, for handling, freight and transportation charges, interest, insurance and storage.

When material is stored, certain decreases in value are usually incurred, such as those caused by shrinkage, spoilage, obsolescence, defects, wastes and seepage.

When manufacturing commences, a series of changes (usually increasing) in the value of the material begins, as the result of work done and skill applied.

We might also mention here the increase and decrease in values due to market conditions, but will not discuss this phase, inasmuch as it has to do with economic laws and principles rather than industrial endeavors and accomplishments. This gambling with markets should not be considered a part of manufacturing, and records of such changes should not be confused with or be made a portion of manufacturing costs, but should always be indicated separately.

We will consider in these pages only the classification of materials for the collection of costs, assuming that all requisite systems, such as proper purchasing, receiving and stores accounting, with the perpetual inventories, requisitions and order forms necessary to go with them, have been developed or can easily be originated.



The circumstances which will determine the correct classification of material costs in the average business may be described in three broad divisions:

1. The store or warehouse where material is simply purchased, stored and shipped without the performance of any work on it.

2. The manufacturing plant where materials are manufactured in large lots and put into stock for future sale and shipment.

3. The manufacturing enterprise which manufactures and assembles on order and contract only, and which usually contracts for the sale of the completed product before it commences to work upon the raw material.

A combination of two or all three of these circumstances is often found in one organization.

In the store or warehouse the classification of material costs is comparatively simple. Costs are chargeable against classifications of each kind of commodity as purchased. Further subdivisions under these classifications may be arranged for whenever differences in sizes, grades and quality of materials make this course practicable.

Where materials are manufactured and stored for future sale, proper stores accounting with records showing average requirements, and the limits below which replenishment is necessary, simplify the entry of orders for lots of either unit parts or entire assemblies of the articles manufactured. There are exceptional cases such as shipyards where raw materials for such orders are

purchased for each individual lot, and where the cost of materials can be charged to the order or lot to which it applies as it is received, and can become a portion of the cost of the finished product.

If raw materials are bought in large quantities and stored for use on such orders, the original cost of the materials, plus the cost of transportation, storage and handling, is chargeable to the orders as they are withdrawn from the stock rooms and used.

This should be done, however, only where these items are especially large because of speculative or seasonable conditions.

In arranging for the recording and accounting of materials, there are a number of features which should be taken into account in order to develop proper control.

For instance, it is very well recognized, although not as universally as it should be, that the economical method of purchasing is through contracting at one time for a supply of a commodity to take care of requirements for a long period, say six months or a year.

The record of the use and issuance of the material should therefore be outlined so that the use of material can be properly analyzed as to how it was used, on what work it was applied, the relative quantities over a certain period, the possibility of substitution, reservation of present stock against orders uncompleted, the reservation of stock to cover work on which bids were made and which

would probably be closed, and the tendency of future requirements. This record should therefore provide a complete picture of present conditions as well as prophecy for the future.

Without it contracts are placed arbitrarily and haphazardly, with the result that in some cases complete requirements are not provided for and extra lots must be purchased at increased prices to take care of the shortages, in other cases too much material is contracted for, tying up an unnecessary investment and, what is sometimes worse, filling valuable storage space.

As an instance of this last condition, one case was noted where a supply of a certain bulky material, enough stock to take care of requirements for ten years, had been contracted for through lack of thorough analysis. This stock took up so much space that it made quite impossible the storage of regular moving stock without continuous rehandling at a heavy additional expense.

It is, of course, hardly necessary to do more than mention the effect on production of shortage of materials and parts, sometimes even seemingly unimportant parts; such shortages can often be traced to lack of material records to aid in specifying, purchasing, and contracting for material requirements.

Records should therefore be provided which permit of complete study and form a basis for the wise control of this highly important function.

In order to purchase economically, markets and

prices must be studied and fluctuations carefully watched. The tendencies must be followed. Here, too, material records should play an important part. They should provide a history of price changes, purchases, sources of supply, and changes by substitution of different sizes or different qualities. In other words, there should be such records of purchase and use as will provide a foundation for judgment in economical purchasing.

The material control should also be developed so that it actually does control the consumption or use of material and its application on the work or orders for which it was intended. It should provide means for reserving certain portions of material for special orders as soon as they are entered and it should provide the means of forcing the use on such orders. This does not necessarily mean a physical allotment or reservation of the material although this is sometimes desirable.

This control is necessary, first in order to know at all times the condition of stock not only as issued but as booked in orders. If such bookings are not provided for, economical purchase of materials needed to fulfill all requirements cannot always be made, shortages are not noted until they actually occur and delays in production naturally follow; further, it is difficult to make any sort of estimate as to what additional orders can be accepted and what promises for delivery can be made, because there is no record of the quantities needed for unfilled or uncompleted orders.

The material control is not complete unless it provides for immediate report and proper record of receipts. This is a big feature in itself. There must be an almost instantaneous tie-up between the receiving department, material control and production departments. Receipts must be reported correctly, in detail and promptly, so that at all times the stock records represent a complete picture of actual stock on hand up to the minute. It has been found in many cases that production was delayed, workmen idle, and machines shut down, presumed for want of material, when the material was actually in the receiving room or, in fact, in stock, but did not show on the stock record because of lax or incomplete record of receipts.

Closely allied with the keeping of the receiving record is the question of inspections. Inspection of materials must be made as promptly as possible after receipt, and reports must be immediately made. It is, of course, useless to record material as received and proceed with arrangements for its use only to find the material incorrect in quality, design, or kind. Inspection must be reported as quickly as possible in order to prevent delay in issuance of receiving reports and records of available stock.

Finally, records of waste, spoilage and rejections must be provided. These should give an analysis of such wastage, indicating causes. They should show why and where spoilage occurred, whether in use and for what reason, whether because of laxity



or errors in receiving, whether because of certain conditions of storage detrimental to the materials or parts; they should give, in fact, any details which might furnish a clue, too, for the elimination of such wastes in the future. In some plants and industries this study leads to a complete reorganization of methods, to the inauguration of various inspection systems, process inspections and the like. They are very valuable records.



## CHAPTER XII

### INDIRECT MATERIAL COSTS

**I**N APPROACHING the discussion of the collection and distribution of indirect material costs, we wish to emphasize that this particular expense is one which is probably most often and most easily overlooked and lost control of in the average organization; furthermore, that reduction of this expense, in the majority of cases, has the advantage of being a net saving—a dollar earned for each dollar saved.

By indirect material we mean all materials which are used for the supervision, control and maintenance of the plant, buildings, equipment or commodity carried or manufactured, and of which the period of usefulness is so short that it does not permit of charging them as an asset or an investment. In no case does this include materials held for sale, or upon which it is expected that profit may be made.

Prices remaining the same, it would, of course, be most economical to secure such materials from

their source of supply as they are required and in neither greater nor less quantity than needed. This is impossible, and it is necessary in the majority of cases to purchase larger quantities than are needed for immediate requirements to be held in reserve for future use.

Inasmuch as a large proportion of these materials constitute parts and supplies necessary for the prompt repair and renewal, as well as maintenance, of important equipment, and it is vital to have such materials available for immediate use, it is, therefore, found necessary to carry a more or less complete stock of such supplies and parts.

In the distribution of the cost of these purchases, much divergence is noted. In some cases the invoices for this material are charged to the general merchandise account, and no distinction is made between it and the merchandise which is sold for profit. Sometimes no further distribution is made, and it is expected that the direct materials will absorb the cost of the indirect materials in this way. It is obvious that with this method the cost of such material cannot be studied or analyzed, and that control of it is impossible. Where further distribution is arranged for, it is often difficult still to study these costs, inasmuch as the unaccounted for amounts, due to obsolescence, shrinkage, errors in stock keeping, etc., are not brought up separate from like charges on direct materials, and therefore are overlooked and incorrectly disposed of.

In other cases it is attempted by arbitrary dis-

tribution to charge each invoice for indirect materials to the operating and expense accounts. Such distribution must be left to the judgment of one who supposedly has had long experience and knowledge gained from past performance and use of this material. This is seldom, if ever, accurate, and further, the various departments and accounts are charged with this material cost as it is bought and paid for, without any reference to when it is used, thus making comparisons almost impossible. Under these circumstances it is usually found that the superintendents or executives to whose departments such invoices are charged object strenuously to the purchase of more material than is necessary for immediate demands, however economical and advantageous it may be to so purchase it, since this increases their costs beyond all proportion.

The most satisfactory method for all purposes is to provide an account distinct from all others to which such invoices may be charged until the material is used. The account may be called "maintenance supplies," "tools and supplies," "supplies" or by any other term which may be considered more descriptive. The materials should of course be stored in proper store rooms, either with or separate from the stock of direct materials, preferably separate, and stock records of the most approved kind should be kept of each item, showing complete description, amounts, high and low limits, prices, etc. Where this stock is not so extensive, it is, of course, possible to modify the

methods in proportion to requirements by placing materials of this kind under lock and key in charge of the department foreman, who keeps necessary records of stock.

The withdrawal of this material should be only through a requisition form. Requisitions should be issued and signed only by authorized persons, and honored only when so issued and signed. The requisition should show beside this signature the name or number of the department, workman and machine to whom and for which it was issued, and should indicate the account chargeable by suggestive or mnemonic symbols where these are possible. This supply requisition should be used to check off the issuance of the material it covers on the stock records.

This supply requisition, when priced, becomes the charge against the various accounts on the cost statement, and for this purpose should be recorded and filed so that information may be secured at desired periods, and so that at the end of the month a total distribution statement for the month may be drawn off, showing the amounts chargeable to the various accounts, which are used to credit the book account, maintenance supplies, or other accounts involved.

In classifying these expenses for use on cost statements we find five general divisions which should be separately classified wherever possible.

1. Supervision—to which all such materials as are used for administration or supervision of the

department or plant, such as stationery, should be charged.

2. Service—to which materials required for giving proper service to all workers and departments in order to facilitate their greatest effectiveness should be charged.

3. Heat, Light and Power—to which all materials necessary for repairs, renewals, upkeep and maintenance of equipment used to furnish heat, light or power, should be charged.

4. Maintenance—to which all materials necessary for the repairs, renewals, upkeep and maintenance of machinery, tools, and equipment, such as repair parts, oil, and waste, should be charged.

5. Rent—to which all such materials as are required for the repairs, renewals, upkeep or maintenance of buildings or grounds, such as new flooring and window panes, should be charged.

Further subdivisions may and should be provided to suit the local conditions, so that a study as definite as possible may be made of the use of this material. For instance, under Maintenance, we may separate materials used for repairs and renewals, such as machine parts, from that material used for the general maintenance of machines and equipment, such as oil, grease and waste.

It is found advantageous to provide supply requisitions in duplicate and triplicate so that they may be simultaneously filed according to accounts, men or machines.

The amounts of each commodity used are inter-



esting, and an analysis of this factor often proves beneficial.

In order to secure the co-operation of the workman in the reduction of indirect material costs, it will be necessary and advantageous to have definite and accurate knowledge as to the amounts used by each workman or gang, and for the various machines and equipment. It will be found interesting to note the effect of a statement, posted or circulated, showing the amount of this material used by the various workmen; it can be arranged so that the man who used the most material heads the list, and the man who used the least appears at the end. In this way the gallon of oil or pound of grease becomes dollars and cents, and each withdrawal becomes a purchase charged to the men for which they will later pay by a higher rating on this competitive statement.

It may be also found advantageous to send each foreman a copy of all supply requisitions, priced, covering the previous day's withdrawals: in other words, to bill him for his previous day's purchases. He will often find ways of reducing these purchases.

There is another point which is deemed most important in the purchasing of renewals of old stocks of indirect material and the addition of new stocks. That is the absolute necessity of complete control of such purchases. It may be assured by requiring the approval of the general superintendent, works manager or an executive of equal ability and authority on all purchases. Foremen



are many times tempted to try new kinds, styles and sizes of materials and to do so before old stock is completely diminished. Much money may be wasted by obsolescence of such stocks or by carrying a stock of material altogether out of proportion in size and variety to real requirements.

## CHAPTER XIII

### BURDEN COSTS

**I**GNORANCE as to the amount of and proper distribution of burden, as well as of its effects on production costs and selling prices, is probably one of the greatest hindrances to progress in modern business today. It is usually considered that burden must be watched with but one purpose—to reduce it. Where this is true, and where there is little or no knowledge as to the effect of increases and decreases of burden on total production costs, there is small opportunity for progress unless the management is very optimistic and willing to take chances, or the margin of profit is very large, since most progressive steps involve an increase, perhaps only temporarily, in burden expenses.

Often, under scientific management, burden increases although there is a positive decrease in total unit production cost. One example could be cited where doubling the burden lowered the unit production cost fifty per cent. Yet burden expenses are called unproductive. If this is so, what

excuse is there for their existence? They are unproductive only when they are unnecessary.

Do not misunderstand us: not all increases in burden expense are justifiable and correct, but neither is a decreased or stationary burden expense always indicative that the best results are being attained. What we believe essential is an intelligent control of burden, which can be secured only by exact knowledge of the effect of each increase or decrease in its amount on the total unit production cost and selling price.

A very successful manager stated that business today suffers from "too much burden."

This is, no doubt, true in a great number of cases, and only emphasizes the fact that many times this is due solely to lack of knowledge as to the amount of this burden expense, and what individuals or factors are responsible for it. It is not logical to believe that the brilliant and shrewd master-minds which have developed the businesses where such ignorance of actual conditions exists would allow waste and inefficiencies to continue if they knew them. Some will point out that under scientific management burden expense often increases. This may be true, but it will usually be found where this occurs that there is a complete knowledge of the amount of such burden increases, and their effect upon production.

Here is the field for the cost accountant. He has an important work to do if he will collect and classify all expenses so that they are comprehen-

sive, complete, and correct, and may be studied and analyzed to help control, correct, and increase the efficiency of the organization as a whole.

Burden expenses may be described as all items which are not definitely and accurately measurable against the recognized and satisfactory unit of manufacture or sale of the material or product to which they apply, but which are absolutely necessary in order to continue such manufacture and sale.

The burden classification, if correctly made, should point out the necessity of each burden expense and relation to and effect upon the direct production.

## CHAPTER XIV

### BURDEN CLASSIFICATIONS

**T**HE PRINCIPAL broad classifications of burden expenses are as follows:

1. Indirect Labor
2. Indirect Material
3. Fixed Charges
4. Depreciation
5. Administrative Expenses
6. Sales Expenses (when not directly chargeable to unit produced).

Further subdivisions are, of course, possible and necessary, and vary somewhat with local conditions.

In classifying and subdividing overhead expenses it should be kept in mind that in order to analyze the various items, and decide as to their necessity and effect upon cost and production, definite lines should be drawn as to the responsibility for the various items in the organization. All expenses should be collected according to classifications that define such lines, and should be studied with a view to gaining the co-operation of

the responsible factors in controlling those items for which they are responsible. Wherever necessary, organization corrections, combining or subdividing authority and responsibility should be made.

With this in mind we suggest a subdivision of our six main classifications of expense into two classes: Burden and General Expenses.

The first class, Burden, should consist of all items for which the executive immediately in charge of the operating department is responsible. Where this department is subdivided into two or more divisions or departments, classifications should be provided to separate those items controlled or affected by each separate division or department, and, in addition, to cover the expenses controlled or affected by these departments as a whole.

For instance, where an operating department is divided into three separate divisions, each division may have its classification of supervision, for instance, its particular foreman or executive and dispatcher. In addition, it will carry part of the expense of a central time keeping cost department as well as its share of the salary of a general superintendent or works manager, and, possibly part of the cost of an efficiency department. Usually a fair distribution of such central office charges can be made easily, but should in all cases be separated from those items directly controlled by each department.



It is often found possible and necessary, in order to study and control production correctly, to classify and distribute burden expenses to individual machines or operations, and in such cases it should, of course, be done.

The second class, General Expense, should contain those items of expense not controlled or affected directly by the executive in charge of the operating department, but which are necessary to the general administration of the business. They are usually derived from the cost of original investments and particular equipment and their protection against losses, damages or fire.

Just how the six main classifications of burden expense will be divided between these two subclassifications, Burden and General Expense, depends upon local conditions and the distribution of responsibility and authority.

Whatever this distribution may be, it should clearly define the responsibility for each item. No items should be lumped under one class as one total, which are controlled in part by one section of the organization and in part by another section; this opens the door to misunderstandings as to the share of responsibility of each individual or section.

It is, of course, often the case that one entire item or classification may be equally controlled by more than one section or branch of the organization, but all such items should be classified and charged so that the responsibility for the total

amount of each classification in the burden distribution is traceable to some certain division or divisions of the organization.

In many organizations there is a policy against giving complete cost information to workers and executives and taking them too fully into confidence.

If the burden distribution is classified as suggested above, making it possible to furnish to each department and executive only those figures with which each is directly concerned and for which each is responsible, this objection and difficulty in securing co-operation of all concerned in reducing costs will be eliminated.

After the burden classification is decided upon, changes should rarely be made since by them comparisons will be made very difficult and in some cases impossible.

## CHAPTER XV

### FIXED CHARGES

**F**IXED charges are important elements of cost often-times neglected in a development of burden. These include items which are, as their name indicates, a definitely fixed charge or rate against the operation of the plant. For instance, in this class we find insurance, divided under fire, liability and life, certain kinds of taxes, and finally rent.

These items should wherever possible be classified so that if measurable against a given department, they can be included in such departmental burden rates. For instance, liability insurance can be carried direct to the department when based upon actual payrolls of the various departments. Fire insurance can be distributed when based upon valuations.

Taxes can usually be distributed when based upon the proportion of the value in a given department, to the total value used for taxation of all departments.

Rents are, of course, easily apportioned on a basis of the space used by the various departments.

All these items should be so classified as to offer current comparisons and to show the relative effect of these items of costs in the various departmental burdens as well as in the general indirect burden.

They should be classified further under as many headings as necessary to keep them distinctive for proper comparative purposes. For instance, liability insurance may be classified under headings which indicate the types of labor covered. By the mere classification of labor under these headings and the application of the rates of liability insurance for each class, a reduction in the total amount of liability insurance has been found possible. This is an item which it will pay most executives to study carefully.

Where heat, light and power are purchased, this is often a fixed charge, but it can and should be charged direct to the department in order to get best comparisons and burden distributions.

Heat can usually be distributed when based upon the area of heated spaces.

Light can often be metered to each department separately, or if not, can be distributed on a basis of the wattage of lamps used, and estimation of the hours of consumption which, of course, varies by seasons and according to hours worked.

Power can often be metered directly to each department. Where this cannot be arranged the horse power used by motors in each department, proportioned to the horse power used in all departments can be estimated and used as a basis. It is

important here to consider as the basis the number of hours the various motors are actually in use, not the total working hours for all motors. For instance some motors are used only one hour each day, others for approximately half the time, others constantly. This varies by seasons and the basis for charging should be changed when the variation is very great.

## CHAPTER XVI

### ADMINISTRATIVE AND SELLING EXPENSE

**U**NDER administrative expense we come to a consideration of the general items of expense which, while necessary to the operation of the business in general, are not traceable to direct cost of the product except under these broad classifications and distributions.

This expense includes salaries of executives, salaries of office clerks, traveling expenses, office supplies and expenses, charities, maintenance and cleaning of office buildings, general yards, entrances to plants, etc., watch service, telephone and telegraph, printing and stationery, association expenses such as memberships in trade organizations, local improvement organizations, etc.

In this class of expense the same rule holds as suggested for other types of burden, i.e., that it should be classified so that responsibility for the various items can be traced to departments and individuals with only a minimum classified as general.

These items, too, should be carefully classified according to their distinctive nature so that cur-



rent comparisons can be made and any great variations can be quickly detected.

It should always be remembered that this class of general expenses offers a field for great reductions merely because it can easily become a general "burying ground" for all sorts of unaccounted for and unclassified items. The ideal classification of administrative expenses includes no such account as "general" or "miscellaneous," or one in which the amounts of such charges each month are small enough to be almost negligible.

The classification of this type of expense, of course, varies with local conditions. Each type of business naturally offers specific classes by which comparisons will be especially valuable. It would be impossible for anyone to suggest a classification comprehensive enough to cover all purposes. However a possible minimum general classification of administrative expenses to include the fewest divisions possible would be:

1. Executive Salaries
2. Clerical Salaries
3. Stationery and Office Supplies
4. Rent and Building Maintenance
5. Telephone and Telegraph
6. Traveling Expenses
7. General—including Charities, Dues, etc.

Selling expense should, of course, be classified entirely separate from these general administrative and office expenses. Where a chief executive

divides his time between sales activities and general administrative functions, proper distributions should be made. Traveling expenses, stationery, clerical help, salaries of all kinds, telephone and telegraph expenses should all be properly distributed where applied on selling and kept entirely separate from general administrative charges. Advertising is, of course, chargeable to selling expense alone.

It is always advocated that selling expense be tabulated as a separate and distinct charge. However all that has been said of proper classification by classes of expense for comparison and control purposes, as well as of subdivisions offering opportunity for tracing responsibility, holds good here as strongly as it does with any other item of expense.

It is valuable, of course, to provide records of selling expenses in a way that makes them prophetic. Provisions should be made to record costs of sales by districts, territories, salesmen and classes of product. Classifications should indicate the comparisons of various kinds of expenses, should permit of tabulations of records showing comparative unit costs and results, and should allow detailed analysis.

The distribution of administrative and selling expenses as a sur-charge is, of course, different than that of plant burden and will be discussed in a later chapter.

## CHAPTER XVII

### INTEREST ON INVESTMENT CHARGED AS COST

**P**ROBABLY no single feature of cost distribution and accounting has been debated quite so consistently without the development of a decision wholly satisfactory to all as the question of interest on investment and borrowed capital.

There are those who claim that it should be charged as a definite item of cost, since such amounts if invested in bonds or mortgages would secure a definite return without time or effort of the investor, also that he should receive this return for the additional risk assumed in investing in a manufacturing enterprise. On the other hand there are those who insist that by charging this element to cost the manufacturer anticipates earnings, that he cannot secure profit until the product is sold and hence interest is merely a part of profit.

Whether or not a definite settlement of this question will ever be reached is indeed doubtful. After a long study of both sides and an analysis of arguments coming from the advocates of each

plan, the writer confesses that he is in doubt as to whether or not either plan can be recognized as best in each and every case, and believes that unless some absolutely decisive points are brought out we will continue to find both methods used, their application being controlled by individual circumstances.

Considered purely from the side of cost control there may be one argument of particular interest which has not been very extensively recognized in favor of the first plan: that by including this item in costs it is brought to the attention of the executives responsible for costs and hence forces upon them a greater appreciation of their responsibility to the owners for their money expended.

In a consideration of this problem we will devote this chapter and the next to a statement of arguments brought out under various conditions regarding both sides of this debated subject. This chapter will devote itself to a further discussion of the first method.

In this connection an interesting meeting indeed was that of the Western Efficiency Society, when a debate was held between that society and the Illinois Institute of Accountants on the question, "Should Interest on Capital Invested Be Charged into Manufacturing Cost?" Each society was represented by a team of three members. The Western Efficiency Society's team defended the question, while the Illinois Institute of Accountants' team opposed it.

It is a matter of record that the judges reported a close decision based on points in favor of the affirmative.

The affirmative argued that in order to secure complete cost data for comparison and analysis, every item of expense necessary in production should be included; that inasmuch as equipment, buildings and lands are necessary to production, the interest on the investment they represent should as rightfully be considered an operating expense as the depreciation or the upkeep on such equipment, buildings and lands. They argued further that this was absolutely essential in order to secure standardized costs for comparative purposes.

It was pointed out that if a building were rented for manufacturing purposes, the rent charged for this building would be readily accepted as an operating cost. But this rent would certainly include the interest on the investment; therefore, if the building were bought or built instead of rented, the interest on the money invested must be charged into manufacturing costs as would be done with the rent. It was pointed out that if this were not done, the manufacturer who rented would show a cost higher than that of the man who used his own capital, while actually the cost would be the same, or only slightly different.

Further the defense showed that the two conditions might occur in different departments or plants of an organization, or during different



periods of the organization's activities, and that in order to secure cost data which would be truly useful and correct for comparisons of work in different departments or plants, or during different periods, it would be necessary to standardize the basis for figuring these costs. Since rental charges for equipment, buildings and lands have been accepted by long practice as legitimate expense, such items used in making up this rent must also be included. Interest was considered one of these items.

The negative argued that interest was rightfully a profit on investment and, therefore, should be taken out as a part of the profits, and that, from an accounting point of view, to use a valuation which included interest charges for inventory purposes was incorrect. They stated further that the attempt to secure a cost which included every item was impractical, inasmuch as it was impossible to definitely measure all items of expense against cost. They believed this attempt was being carried too far and that theorists were its only advocates.

They pointed out that it was impractical to include the interest item in costs because rates of interest varied greatly and were therefore difficult to establish.

Another negative argument was that court decisions had been made against this practice.

In rebuttal the affirmative disagreed with the statement that interest on investment made to



produce for profit was a part of profit itself. They argued that this method of charging interest on capital invested into manufacturing cost was in practice by a great many successful and typical companies who were finding it advantageous, and that it was advocated by recognized authorities of good repute. That certain items could not be definitely measured, was in reality an argument for, and not against, charging interest into manufacturing cost, since as many items as possible should be definitely charged, and interest was among the possibilities.

They claimed that interest rates for any investment were unstandardized and would be whether interest was taken from profits or included in costs. That this was the case was no argument against the theory of charging an acceptable rate, which would be recognized as conservative, although probably not standardized.

As regards court decisions the affirmative argued that such decisions were made because of misapplication of the information secured rather than because of the theory of the practice itself—and further, that court decisions of this nature were recognized as not altogether authoritative.

Both sides were well equipped with authorities for their arguments, which points out that this is a subject debatable not only by societies but by many individuals as well.

Another interesting opinion on this subject is that brought out by Mr. George W. Veale in an

article published in 100%, *The Efficiency Magazine* in June, 1917. It is reprinted here by permission. The influence of war production and cost plus contracts is well indicated. The article follows:

“The prospects for limitation of profits on goods manufactured for the government and to be used in prosecuting the war, will naturally raise much discussion as to just what shall constitute the cost upon which the limited profit will be permitted.

“For years cost men have held for open debate, the question of including interest on invested capital, but now this point has a renewed interest and takes on a somewhat different aspect. If the exponents of the negative side have enjoyed the greater popularity in the past it would seem certain that they are now due for a reverse; at least during the period of the war.

“In normal times when profits can be controlled by quality and competition plus good advertising, it no doubt is safe to figure costs without including any interest on capital, allowing that the profits cover the interest on the money invested, as well as the reward for a good product, and good management. However, if the government work is to be taken on a ‘cost plus’ basis, it is doubtful whether the allowed percentage would be sufficient to conduct the business successfully and pay dividends.

“The investing public can be induced to risk its money in business enterprises only when it can be shown chances for large profits, and therefore, if

the immediate future holds out prospects of limited profits in certain lines, there will undoubtedly follow a heavy unloading of such securities, when the money will naturally gravitate to more lucrative fields.

“There are innumerable opportunities for investing funds in ways where the principle is secure, and, where, though the interest or profit is small, it can be had with a minimum of effort and worry, and for this reason the braver man who will risk his money backed by his energy and good judgment, in an enterprise that is of immediate use to the government in a time of great peril, should be guaranteed at least the same opportunity of making the same profit as the more timid and conservative man who prefers to invest in bonds and other securities, and he should further be given an opportunity for a greater reward, because of his industry and daring.

“This means then, that if contracts for government work are to be let on the ‘cost plus’ basis, it should contemplate that a stated per cent of interest on the invested capital be included in the cost.”

## CHAPTER XVIII

### INTEREST ON INVESTMENT TAKEN FROM PROFIT

A VERY interesting series of arguments in favor of taking interest on investment out of profits rather than of making it a charge against costs was brought out by Mr. C. E. Knoepfel in his testimony in the case of the American Newspaper Publishers Association against the Manufacturers of Newsprint Paper before the Federal Trade Commission in May, 1918, when he was retained by the former association to present expert testimony on this subject. We are privileged to offer this in the following:

“Costs of operation should not include in them any charge covering interest on investment, as this would serve to anticipate earnings, through including a profit before it was made. What is actually put into a business is the investment. What is actually earned, is the interest or return on the investment.

“Interest on borrowed money should not be made a charge against cost of operations, as borrowed money from the viewpoint of operations, is equivalent to capital invested. An industrial with

sufficient capital to build, equip, and provide working funds should pay the returns on the investment out of profits. Borrowed money indicates insufficient capital invested, making it necessary to bring in additional funds, and the interest charge should likewise come out of profits."

This is the general brief outline of the testimony. The further analysis brought out by Mr. Knoepfel follows:

"Money put out in bonds and mortgages at four per cent carries only very small elements of risk. An individual who goes into industrials carrying a greater hazard, for which he expects to make a much greater return, may even feel that he may lose all, and to charge interest which could have been realized in a safe investment against the operating expense of a business wherein there is a much greater risk is manifestly wrong, for this is equivalent to determining that the industrials earn a profit, thereby putting it up to a certain point in the class of guaranteed propositions, which it really is not. Further would that investor if he put his money in bonds and mortgages charge himself with a loss by the difference between what he nets and what he might make in an industrial?

"Including interest on investment in a strictly competitive business in cost of operation may mislead to such an extent as to operate against getting the business which should otherwise belong to the concern.

"Including interest on investment in cost results



is a wrong conception of costs since on top of costs must be figured a profit that will yield a fair return on the investment; the double addition is really very confusing.

"Figuring interest on investment in cost of the product is equivalent to securing profits before they are earned. There can be no profits where there are no sales.

"Interest on borrowed money is the same as dividends paid out of profits as the money is borrowed because there is insufficient capital. If there were sufficient capital the interest saved would be a profit and go out as dividends.

"Further why should a consumer have to pay the penalty of management's inability or unwillingness to provide sufficient capital to properly run the business?"

In the same case Mr. H. L. Gantt in giving his expert testimony on this particular feature briefly stated:

"The cost of the article or commodity should include only the actual labor, material and expense necessary for its manufacture and should not include a profit through the various steps of manufacture."

Here we have the viewpoints of two engineers who have made studies of this problem for many years. Further investigation will show that they have many supporters in their contentions.

As will be seen after a study of the arguments brought forth on both sides of this question, there



are, seemingly, very logical principles supporting each, and one can easily come to the conclusion that which plan you should follow depends upon what you are trying to prove.

In either case it should be recognized as a responsibility by the managing executive, regardless of the way the effect is brought to his attention, and regardless of which plan is followed. It is a part of the final price charged for the commodity; hence it must never be entirely neglected in this reckoning.

There is probably more harm done in business practice today by failure to include this item at all, either as a part of costs or of profit, than by error in choosing the proper method.

## CHAPTER XIX

### DEPRECIATION

**T**HE METHOD which is followed in handling depreciation, or the failure to consider it at all, often represents the difference between success and failure in business.

Depreciation is a class of burden expense which is much neglected and misunderstood, possibly due to the fact that the expenditure does not appear to be immediate, that there is not the same evidence pointing to the fact that such expense has been incurred as there is for other expenses, such as labor and materials, which are paid for currently, and that, further, it is so difficult to predetermine exactly the amounts chargeable to this item.

Just how many millions of dollars have been lost through the failure to properly charge depreciation, or to charge it at all, or through misapplications, it would be very hard to estimate. Edward N. Hurley, in his report to the Federal Trade Commission, gave it almost first importance.

It is hard to understand why otherwise shrewd

and conservative business executives, who will bargain for material, wages and other operating expenses and will cover themselves fully on these items in their selling prices, do not recognize in any way whatsoever the cost of depreciation of their facilities and equipment as a production cost.

The expense is going on daily although its existence is not emphasized by actual daily expenditures. It is only when a machine or piece of equipment actually goes out of use and must be replaced at great expense, that many executives realize the existence of this expense at all.

Fortunately the Federal excess profits tax has forced a greater appreciation of depreciation as a factor in operating expenses. This should certainly tend to bring about a greater recognition of depreciation as a part of cost as well as further research as to methods and extent of this inclusion.

The problem of depreciation should be recognized as a real engineering problem, involving as it does the consideration of the use, application, cost and value of equipment and so many other factors with which only engineering experience can cope. It should not be disposed of merely as an accounting record made to follow percentage plans rumored to be in use elsewhere. Properly handled it usually requires an engineering appraisal or revaluation, then a study of particular conditions and circumstances in each case to establish the basis for further handling and charging.

The various changes which occur to affect the

value of lands, buildings and equipment, and in that way to change the amount of capital upon which interest should be charged, are worth much study and discussion, and bring into consideration the question of depreciation.

Lands seldom depreciate or decrease in value, and their valuation usually remains the same for very long periods.

Any increases which are legitimate and conservative can be taken care of by periodical revaluation and appraisal.

Buildings and equipment seldom, if ever, increase in value and in most cases depreciate. This depreciation is due to two general causes:

1. Because of wear and tear on buildings and equipment, which after a certain term of usefulness makes necessary the replacement of part or all of them.

2. Because of the fact that changes in business, new inventions, and changes in method often make it necessary to change and improve buildings and equipment and make those in use obsolete.

It is, therefore, necessary to decide their term of usefulness and charge off to operating expenses as a burden item, periodically, a sum equal to the amount of their decrease in value for the period carried. To estimate and determine the length of this term of usefulness is usually much more difficult than it seems, and requires good judgment and counsel, backed by much experience.

The more important factors which must be con-

sidered in determining the term and rate of depreciation are as follows:

1. The original value of the items
2. The kind of equipment or building
3. The use to which they are put
4. Their location
5. Their probable value after their term of usefulness is ended
6. The method of upkeep and maintenance
7. Whether or not they will be in constant use or the estimated time they will be in use
8. The probable length of time which the manufacture or use to which they are put will continue
9. The probable length of time they will be in use before change in method or new inventions will make them partially or wholly obsolete
10. The probable length of time they will last before wearing out to such an extent that they will have to be replaced
11. The policy of the organization—whether it is conservative and wishes to be fully protected against all future and probably remote emergencies, or is willing to risk future losses to show present profits.

Much more could be said about each of these factors, but we wish to emphasize that in every case some of them, and in many cases all of them, must be considered.



It will be noted that many of these factors are only approximations and very difficult to determine, so that here good judgment must be exercised and the best available counsel and practical experience in the use of equipment brought into use. Unfortunately it is rarely possible to compare rates of depreciation in one business with those in another, except in a very general way, because of the fact that some of the factors mentioned above will be changed, and there are very few records of past experiences available for reference which are valuable.

Terms of depreciation on buildings commonly range from one to fifty years and on equipment from one year to twenty-five years.

The cost of foundations and installation of equipment should not be included in the value of the equipment, since this work usually has little value in case of resale. In some cases it is charged as a current expense. Probably the more correct method is to depreciate it very quickly over a short term.

There are two methods between which to choose in charging off depreciation. The first, to charge off at the rate of depreciation decided upon from the original value; the second, to charge off at the rate of depreciation decided upon from the net value each year after previous years' depreciations have been deducted from the original value. It would seem that the first named method is the least complicated and most logical.



The correct method of disposing of depreciation so charged is to put these amounts into a reserve fund, which is used to pay for replacement of buildings and equipment as this becomes necessary.

In order to handle the depreciation correctly and most satisfactorily it is necessary to develop a record of all equipment and buildings upon which depreciation charges are made, and keep it up-to-date. Then, by collecting the various items into classes according to rates of depreciation, the work of calculating the correct amounts will be facilitated.

In classifying these charges the same rules should be followed as described for other burden expenses; that is, to classify in such a manner that the responsibility for the various items may be easily traced. They may be classified according to machines, operations, departments or divisions.

## CHAPTER XX

### BURDEN AND EXPENSE DISTRIBUTION

**A**FTER we have properly collected and classified each and every item of burden expense; after we know exactly how much has been expended for every class of expense burden, how shall we determine the proper percentage to be charged to various departments and productive divisions; to each order or contract; to each hour of labor or machine work, and finally to each unit of production? How can we determine the effect of burden on the cost of production, or what portion it represents of the selling prices of the various commodities handled or produced?

It can be stated emphatically that there is no one method which can be followed as best and correct for all businesses in distributing burden expense.

We will first discuss the methods of distributing the burden or those expenses which have been classified directly against the individual operating department or division. This does not include the general expenses and selling expenses the dis-

tribution of which will be discussed later in this chapter.

There are four methods of burden distribution which are commonly used, as follows:

1. Percentage on direct wages
2. On a basis of direct labor hours
3. On a basis of machine hours
4. On a basis of material cost or quantities.

The percentage on direct wage plan is usually used where wages are paid on a piece rate basis, where time keeping by hours is disapproved and where wages constitute a large portion of the total production costs and vary greatly.

To make this distribution it is necessary to determine the percentage of the total burden to total direct wages for any stated period, and charge each product with an amount determined by this percentage of the direct wages expended on the product.

Distribution on the basis of direct labor hours is usually made where work done is accounted for by hours direct labor. Here the total burden is divided by the total number of hours direct labor, and each hour of direct labor furnished to produce a given commodity, or to accomplish a certain job, is charged with a burden cost at this burden rate per hour.

Distribution on a basis of machine hours is usually made where most of the work is done on machines, and a large proportion of the burden

cost represents investment in equipment. To make this distribution it is necessary to determine exactly what costs are chargeable to each machine, and divide these costs by the number of hours the machine operated on productive work, to determine a machine hour rate. The number of hours, machine work put in to produce each unit is multiplied by this rate to determine its cost.

Distribution on a basis of material cost or quantity is used in warehouses or large storage yards which go beyond the realm of ordinary manufacturing stores or stocks, where material represents the greater portion of the cost, and where the product is all the same or divided into certain large general classes.

Distribution on a basis of material quantity is, of course, also applied in such plants as foundries and blast furnaces where tonnage produced is the practical unit of measurement.

If distribution is made on the material cost basis, the percentage of burden costs to material costs is established and applied at that rate. If distribution is made on a basis of units of material, the total burden is simply divided by the total units and a rate per unit established.

The above methods briefly cover the distribution of the burden, or plant and departmental overhead. The next several chapters will discuss these methods in greater detail.

The method of loading or distribution of the administrative or general expense, that expense

which cannot be definitely allocated to the individual department or plant, and of the selling expense, is more commonly understood and generally accepted. There is really but one practical method; it is to distribute these expenses as a surcharge on the total value of the product, including in this value all the elements of cost with burden added. Selling expenses should, of course, be shown as a charge separate and distinct from general expenses.

## CHAPTER XXI

### PERCENTAGE TO DIRECT WAGE BURDEN DISTRIBUTION

OF THE four methods of burden distribution in ordinary use, the percentage to direct wage plan is probably the most common. There is due, no doubt, to the practicability and simplicity of its application, which often cause it to be used where other methods would be more accurate.

It is true that on account of these two qualifications it has certain advantages over other more complicated methods; first, because it often costs less in clerical help to maintain; second, because its simplicity makes it more readily understood by the executives who, after all, give any method of burden distribution its only value by studying and using the facts it portrays.

It should be kept in mind that the executive is usually a very busy person with a mind tending toward generalization rather than detail, who, therefore, requires wherever possible methods of utmost simplicity, easy to follow. How much inaccuracy can be overlooked in view of the prac-



ticability and simplicity of this plan, depends, first, upon the extra cost involved in maintaining the more accurate though less simple method, and second, upon the amount of time and intelligence the executive for whom the distribution is made will devote to the study and use of the results obtained. It must be remembered that although no mathematically correct method of burden distribution is practical, the most accurate records obtainable are still worth considerable energy and money if they are properly and sufficiently used.

The percentage to direct wage method of burden distribution is in such common use that it seems hardly necessary to describe the details of its application, and we will content ourselves with a very brief description of its main points for the benefit of any who may not have had the opportunity to see it in use.

Under this plan all burden or overhead expenses are collected for a certain period, either as a total for each department or under certain classified accounts which are later totaled. This total is divided by the total of all wages paid out for direct labor during this period, in order to secure the percentage of the burden to the direct wages. To secure the cost of burden chargeable to a particular order, contract or commodity, it is merely necessary to multiply the cost of direct wages expended on it by the percentage secured as described above.

This plan has many inaccuracies as intimated before. For instance, a fifty cents an hour

employee, working at a hand operation, requiring less than twenty dollars' worth of floor space and equipment, will carry the same amount of burden as the same priced man who operates a high priced machine carrying five times that amount of burden for depreciation. The only condition of this kind under which the burden will become equalized on any individual order is where each order requires approximately the same amount of each kind of direct labor which is done in the factory. It will be seen that this method is not absolutely correct where there are many machine operations and few hand operations, each of the former being done on machines of a different and widely varying value. If, however, the operations are mostly hand operations, the machines, floor space and other equipment used for each operation are of approximately the same value, this method will ordinarily be found to be as correct as any.

Many inaccuracies are pointed out where the rates of men working at a given operation vary greatly. For instance, a workman rated at forty cents per hour will carry only half as much burden as the one rated at eighty cents per hour, even when he works on the same kind of operation and machine. It is further pointed out that the first man should properly carry more burden than the second man because he is probably newer in the work and requires more supervision and instruction, and also because he probably breaks more tools and spoils more material. This is not as

serious a defect as it would seem, however, because the cheaper man in most cases requires much more time to perform the operation than the more expensive man, and, therefore, the direct wages on a given job, and with it the burden charged, equalize. However, the percentage to direct wage plan will serve its purpose best where the rate of wages for direct labor on each operation, and, better still, for the entire shop or department, is very nearly the same.

## CHAPTER XXII

### DIRECT LABOR HOUR BURDEN DISTRIBUTION

**M**UCH that was said in our discussion of the percentage to direct wage plan of distributing expense burden, applies to the percentage to direct hour plan. These methods are very similar in application, both being based upon labor, and vary only in that the first method requires the use of the cost of this labor for its application, while the second requires only the use of the time. It follows that they have this in common: that they are both most successfully applied where labor, either in amount of time or value, is an important factor in the cost of production.

In application and use the percentage to direct hour plan is just as practical and simple as the percentage to direct wage method, if not more so. A brief description of its application follows: All items of burden or overhead expense are collected under their various classifications, as has been described before, and totaled for a month or any given period. A total is then secured of all direct labor hours expended during the same period and

this total is divided into the total amount of burden expenses, to secure an hourly rate of burden expense with which to charge each hour of direct labor in determining the cost of any given piece of work.

The direct hour plan has many supporters who believe that it has eliminated all the disadvantages of the percentage to direct wage method, particularly because in its application the amount of burden charged to an hour's labor of an eighty-cent man in a given operation is the same as that which is charged to an hour of a forty-cent man in the same operation.

The direct hour plan has most of the other inaccuracies of the direct wage plan, especially because it, too, neglects to take into consideration in any way whatsoever the varying conditions and equipment necessary to the different operations, and it charges the same rate per hour to each operation whether it requires equipment and floor space worth \$20 or \$2,000. This is obviously incorrect, and it will be seen from this that it is not well to use this method of distribution where the floor space, equipment and other requirements vary greatly in value under the different operations.

This can be corrected, however, by a combination of a direct hour rate for workers and a machine hour rate to cover equipment charges.

The development of a standard rate per hour is usually productive of valuable results where the hourly burden rate method is applied, since it

provides an ideal which can be kept before those responsible for the various items of burden expense, and further than this, the actual hourly burden rate can be compared with the standard and a united effort made to bring the actual rate down to the standard.

The original standard rate is developed by accumulating every item of legitimate and necessary expense, and dividing its total by the number of hours which it is estimated every man and machine working on direct labor will be kept busy on such labor; this usually is around eighty to eighty-five per cent. In many cases a bonus is paid to foremen, based upon an efficiency partly determined from an attainment of a high percentage of, or the whole of this standard burden rate. The mere development of a standard rate may serve to bring to light many conditions which were never before known to exist.



## CHAPTER XXIII

### MACHINE HOUR BURDEN DISTRIBUTION—OLD PLAN

THE inception of the machine hour plan of burden distribution can probably be traced to the first attempt to take into serious consideration that which all previously mentioned plans (direct wage percentage, direct hour percentage, material cost or quantity, etc.) failed to recognize properly, viz., the proportionate differences in burden costs between work done on various kinds and types of machines, due to very obvious differences in original cost of equipment, power consumption, floor space used, etc.

Take, for instance, a machine costing \$4,000, with depreciation at the rate of 10%, using floor space annually worth \$500; its total annual burden on these items would amount to \$900. Beside it imagine a machine worth \$500, with the same depreciation rate, using but \$50 worth of floor space. Its costs per year would total \$100. Yet, the burden cost chargeable on two jobs done at these machines would be exactly the same, no matter how long they were used, under the direct wage distribution plan, provided the direct wages

on the jobs were the same. If the direct labor hour plan is used, the charge would be the same if the total direct labor hours expended were the same. Again, under the material distribution plan, if the material cost or quantity were the same in both cases, the charges would be identical. It is such evident and gross errors as these that the machine rate distribution plan aims to eliminate.

There are, generally speaking, two distinct plans of machine hour burden distribution. The first plan we will call the Primitive Machine Rate plan, as it is the oldest and most undeveloped. It aims to take care only of such items as depreciation, insurance and power consumption, which vary to a recognizable and large extent by machines. It neglects all other smaller and more general items. It is, as a rule, used to cover producing machines only.

The second and more modern plan, which we will term the Scientific Operation Hour plan, is, as the name implies, a more scientific analysis of this problem. It aims, by a complete and thorough scientific analysis of every item of burden expense, its source, classification and detail, to establish a burden rate per hour for each and every productive operation, including in this rate proportions of each and every burden item which can possibly be measured to the operation in any manner whatsoever, and distributing any remaining amounts

by any one of the more general distribution plans which best fits the case.

In this chapter we will concern ourselves only with the former plan, leaving the latter for discussion in the next chapter.

A simple example of an application of the Primitive Machine Rate plan will effectually point out the peculiarities of it. A man purchases a motor truck and plans to drive it himself, offering his own services and the truck at a stipulated rate per hour. He arrives at this rate of cost per hour by deciding how much time he believes necessary in which to make the truck pay for itself, the annual cost of insurance, the cost of garage and the salary he believes he should earn, and dividing the total cost of all these items for a year by the estimated total of effective working hours in the year, usually at the rate of eighty to eighty-five per cent of the total.

There are other items, such as repairs, oils, grease, etc., the amount of which he does not definitely know. These he either neglects to consider at all, expecting them to be taken care of by the total earnings, or he sets an arbitrary amount which may or may not cover such items for the year. It should be noted that this brings up one very decided complication, for these indefinite items may total so much that all estimated profits may turn into losses.

Next he encounters what is probably the most troublesome complication to overcome in this

plan—the idle time due to breakdowns or insufficient work. To earn the cost, the machine must work every hour of working time, and this is not always possible. Unforeseen delays will occur. To overcome such losses the rate for the time that the machine is working must be increased, but this it is not always possible to do with any degree of accuracy.

Although this plan applied as described will be as accurate as any, if the burden items are all included, and no idle time occurs, or the amount of it is correctly estimated, it will be noted that even in a simple application it can become, by neglect of these things, very inaccurate. And when the application of the plan becomes more complicated, as it will if two or three motor trucks are operated and the idle time of one is charged to the working time of the other two, and more general items of burden begin to appear, such as supervision, washing, etc., then the method no longer remains as accurate and as simple as many suppose.

In applying this plan to the average manufacturing or industrial plant, complications of greater significance are, of course, encountered, which will tend to make the application much more difficult and far less correct. For instance, all operations may not be machine operations, some may be hand operations which are executed now at one place, now at another, and for which no machinery is required. A definite rate is difficult to establish for such items. A costly machine may operate

but a few hours each day, requiring a minimum of supervision, material-handling labor and other burden items of a general nature, while another and much cheaper machine may operate continually using such burden labor and items in a greater proportion. Such differences must be analyzed and equalized. Finally, and probably most important of all, machines do break down, and they do remain idle for various causes. It is rarely possible to estimate such idleness correctly.

## CHAPTER XXIV

### MACHINE HOUR BURDEN DISTRIBUTION— MODERN PLAN

**WE** NOW approach the discussion of the second and more modern plan of machine hour burden distribution, which we have termed the Scientific Operation Hour plan.

This plan, although much like the older method of machine hour distribution described in the last chapter, aims to improve upon it by broadening its application. This is done by having it cover not only machines but each and every unit operation, including all those done by hand. Furthermore, it analyzes completely, thoroughly and scientifically, all items of burden, charging to these unit operations, directly, all items which can possibly be measured accurately and definitely against them. It also distributes all remaining amounts by any one of the more general distribution plans which can most properly be applied.

The application of this plan is, briefly, as follows: The plant to which it is to be applied is first divided into logical departments or divisions. The floor



space in each department is subdivided carefully into operating spaces, each one allotted to an operation, in some cases containing machines, and in others containing merely work benches or miscellaneous equipment for hand operations. These operating spaces are often called "small shops" or "production centers," and the further development of this plan must be approached from the viewpoint that the distribution of every possible item of burden must be narrowed down to these "small shops" as far as practical.

After a total of all such items has been secured for each "small shop," an estimate is made of the probable number of working hours the "small shop" will operate, and the total amount of the burden items as developed, divided by the total number of hours, gives the burden rate per hour for the operation.

All items of burden which cannot be measured against the "small shops" are collected as a whole and then distributed according to the one of the other methods of average burden distribution which seems to best serve the purpose. Where machines or operations do not operate for the previously estimated number of hours, the cost of such idle time is also charged with this total general item of burden, and distributed with it on the same basis.

It is usually assumed that this plan is more complicated and entails much more clerical labor than other plans. While this is true to a certain degree,

the greater part of the extra work necessary occurs when the classifications of burden items and the division of the plant into "small shops," are first made, and when the rates for each operation hour are originally developed. This statement is made assuming that no further complications arise, such as the need for change in conditions which affect the rate. It is also assumed that the rates, as correctly developed, remain in force for a reasonable length of time.

The Scientific Operation Hour plan of burden distribution has many supporters, and many of its advocates claim it is the ideal method for handling this problem. Their arguments are based upon the theory that the majority of the burden items are of such a nature that they can logically and accurately be measured against the various unit operations. It is pointed out that such items as rent, depreciation on equipment, insurance, etc., can be measured against the operations in accordance with the methods outlined above. They claim, in fact, that the great majority of items can be so measured if they are studied thoroughly and scientifically.

If such conditions obtained in all cases, and no further complications ensued, this plan would indeed be an ideal one, but, while we believe that such conditions do exist in a number of cases, we are convinced that their proportion to the whole is not very great. Our idea of an ideal plan is one

which would cover the majority of cases most accurately.

In a number of cases most of the burden cannot be definitely measured to such "small shops" with any great degree of accuracy, and the plan, at the same time, be kept practical. The value of this plan increases or decreases with the proportion of the total burden that can practically, accurately and definitely be measured to these "small shops." It must be remembered that all burden in excess of items so measured must be further distributed according to some other plan of distribution, which may be inaccurate enough to detract considerably from the absolute accuracy that this plan attempts to attain.

There are also many cases where the conditions surrounding the various operations, and, therefore, the "small shops," change so frequently that proportionately frequent changes must be made in the rate. Unless constant supervision is applied to ascertain such changes, and sufficient clerical help is retained to take care of making the revisions in rate which follow them, the plan loses its value to a marked degree.

This plan also has, as was pointed out before, a disadvantage which is coincident with a disadvantage of the old machine hour plan of distribution. This is the failure to account for lost operating time. Machines break down and there are resulting delays, not only to the machine incapacitated, but in some cases to following machine or

hand operations. Operations, both hand and machine, are frequently stopped for various periods for lack of work. Under the Scientific Operation Hour plan such losses in time, unforeseen and not estimated, must be paid for by the machines or operations which are not idle. Their cost is distributed as a part of the total general burden according to some other plan, thereby merely obtaining the same result in a more complicated manner and with a larger expenditure of effort. To serve its purpose best, this plan must, therefore, be applied where operations are continuous, or where lost hours can easily and accurately be predetermined.

## CHAPTER XXV

### BURDEN DISTRIBUTION ON MATERIALS

WE NOW turn to that method of distribution which uses materials as a basis. This method probably ranks second in use only to those which distribute on a basis of labor. We firmly believe, however, that it is wrongly used in a great number of cases, and is misapplied more often than any other one scheme of burden distribution. Its popularity is probably due to its simplicity and to the fact that it is so easily understood. Its frequent misapplication is due to the fact that while we find it very commonly used, the conditions required to make its use correct and fitting are not so common.

There are two ways of applying burden distributions with material as a basis. One uses a unit of the material for this basis; the other uses its cost. To make this distribution, all items of burden are first classified and then collected as a total for a given period. This total is divided by the number of units sold, shipped or produced during the same period, if it is desired to use units as a basis for the distribution, and a burden cost per



unit is obtained at which rate all such units are charged. If the distribution is to be made according to the material cost, the percentage of the burden to the cost is computed and burden charges are added to the material cost on each job, order, commodity or contract according to this percentage.

In order to emphasize our assertion that this method of distribution cannot be accurately applied in nearly so many instances as is commonly believed, and that its use is often ill-advised, we wish to point out several necessary requirements which should be considered in choosing a method of burden distribution, and which must be satisfied by the method chosen.

All distributions of burden, in order to be most nearly correct, must be based upon factors which cause its existence and control or affect its amount.

There are various factors causing and affecting burden-expense, and the method of distribution most nearly correct will ordinarily be the one which is based upon units or measureable quantities of those factors which caused most of it, and which have the greatest effect upon it. In other words, if the greater part of a burden total consists of items such as supervision, timekeeping, etc., which are caused by labor operations and which can be increased or decreased by such labor operations, a distribution according to this labor would be most consistent. If, on the other hand, the greater amount of the burden total existed because of



material quantity or cost, some method which included a distribution based upon this varying quantity, or a percentage of it to the cost, would be found most accurate. In some cases it is possible to classify burden items according to these two divisions of factors causing burden—labor operations and material—and make the distributions of the totals of these two classes, the one based upon labor time or cost and the other based upon material quantity, unit or cost.

We must, therefore, analyze the items which make up the total of the burden to be distributed, and by the application of the above rule choose the method which will serve the purpose best. It should be remembered that wherever it is possible to use the distribution according to material it has this particular and important advantage—it carries the charges direct to the commodity, which is, of course, the ultimate disposition of all burden charges, without much further detail.

We believe, however, that rarely will conditions be found under which the greater part of the burden is caused directly by the material cost. Such items as burglar insurance and fireproof storage might be directly affected. However, the fact that for some reason or another the market on a certain commodity has suddenly risen does not make it correct to charge this commodity, for instance, with a larger proportionate part of the cost of rent, or supervision. Unless it is a very simple proposition, where only one kind of material is in

use, cost of storage will not be correctly charged off, because we rarely find that the cost of different commodities varies with their bulk or shape. Even where only one kind of material is used this method may not be correct because there may be different grades of the commodity, which, although varying in price, retain the same shape and bulk.

It might seem, then, that rent could be correctly charged according to units (bulk or weight) of the material and this is true, but rent for storage of material is not often a large part of the burden cost, unless in warehouses or stores. Rent for space used by machines or men in manufacturing is often a very large item, and this should certainly not be apportioned according to bulk or weight of material. The large item of supervision charges, caused by the employment of a very large number of workers handling various kinds of material, could not be consistently apportioned according to the cost of the various materials unless they were nearly alike, nor according to the amount of the materials unless all kinds were of the same bulk, weight or shape and were handled in the same manner the same number of times.

Burden distributions, based upon cost of materials, can, therefore, be correctly applied only where the commodity receives minimum handling and has little labor or machining operation performed upon it, where all the material is of similar size, shape, bulk and weight, and where the cost of the material is similar in all cases. Burden distribu-

tions based upon units of materials can be applied best where the first two of these requirements exist.

In the application of these methods we find opportunity for many errors. For instance, expenses which cover the cost of producing or handling material may be distributed for a given period over the cost or units of material sold in that period instead of the cost or units of material produced, or vice versa. Sometimes the amount or cost of material shipped is used as a basis.

The distribution on a basis of material cost will be found useful and correct in few cases beside those representing warehouses or large storage yards which go beyond the realm of ordinary manufacture. The distribution based on material quantity or units will be found correct in such plants as foundries or blast furnaces where tons or pounds produced are the practical unit of measurement.

## CHAPTER XXVI

### CHOOSING THE BURDEN DISTRIBUTION PLAN

**T**HERE is no method of burden distribution which is absolutely mathematically correct and at the same time practical.

To be mathematically correct it would have to distribute a foreman's time, minute for minute, against each job he spent time on either instructing or supervising workmen; it would have to distribute cost of floor space according to the exact amount used by the men, the equipment and the material used on the job, and each of the three for the exact number of minutes this space was used. Power and light charges would have to be metered exactly to each job; the cost of sweeping and cleaning would have to be distributed against each square foot of floor space and redistributed as the floor space was used. If all these minute distributions were practical and possible, there would still remain hundreds of other charges and expenses

which could not be practically distributed and at the same time be mathematically accurate.

We must be satisfied, therefore, with a method, which, while being as nearly correct as possible under the existing conditions, is practical, both in development and application, and also in use. It must not be so complicated or require so much effort to accomplish it that the cost of the energy expended to secure the desired result exceeds the value of that result.

We are earnest and sincere in our belief that cost accounting should be scientifically done, but to be valuable the science must be entirely practical. This must be remembered especially when considering methods of burden distribution. If our enthusiastic search for accuracy in this branch of cost finding is not tempered by a demand for practicability, we will soon find ourselves in a maze of distributions and redistributions which can end in but one thing—"red tape." If carried to excess, this search will succeed only in collecting a vast amount of data which will have cost more to secure and will cost more to use than the value we can ever expect to gain from its possession. This danger is also imminent in other branches of cost accounting, but it is more apt to be overlooked when developing burden distributions, probably because here there are not so many natural and definite limitations to hold us to a practical course, nor can the value of the results be so easily determined as in other branches.

We have pointed out the two fundamental purposes of the burden distribution:

1. To assist in determining a selling price
2. To aid in the analysis of the effect of an increase or decrease in the burden on the total unit production cost with a view to reducing the latter.

Let us discuss this point further, and emphasize the importance of its careful consideration in choosing a method of distribution.

Let us take, for example, an organization which handles a raw product, warehousing and selling it; a number of hand and machine operations are necessary. The price of the product is fixed and the cost of the operations performed cannot be charged to the individual order. It is evident that all the work required by any method which distributes the burden to each order is to a great degree superfluous, especially if done continuously, since it does not serve to fix the price to be charged for that order. It seems entirely sufficient here to distribute burden to the various operations in order to study the effect of increased or decreased burden on these operations. If the majority of the operations are performed on machines, it may be best to develop machine rates, but on the other hand, if they are mostly hand operations, a percentage to direct wage or to direct hours gives the best results. The burden cost of each order might be used, but it is doubtful if its use would obtain results enough better than those obtained



by distribution to operations only, to pay for the extra cost of securing such costs.

There are numerous examples of this kind which particularly point out the great necessity of measuring the effort by the result.

Much of the foregoing discussion is to a certain extent in defense of the position which we take in handling the subject of burden distribution in previous chapters where we attempt to point out that each of the four most commonly used methods of burden distribution, namely, (1) percentage on direct wages, (2) on a basis of direct labor hours, (3) on a basis of machine hours, and (4) on a basis of material costs or quantities, has many advantages under certain conditions, and that for each condition one of these methods, sometimes with minor variation, can be applied. This is in contrast to the attitude taken by some cost engineers, who attempt to develop one method, in itself commendable for certain purposes, and recommend it as a cure for all ills and best for all purposes.

It is, of course, a fact that on straight manufacturing there is really only one correct basis which serves all purposes in a given condition and the decision should be made in favor of the plan which will give the true costs, since this is, after all, the one objective of a cost system.

It has been pointed out that all the plans have definite advantages and disadvantages under varying conditions and that they all have justified applications. Summarizing however, for general

purposes, not forgetting our exceptions, the best plan for all practical purposes that to date has come to our attention is the direct hour plan, or, where equipment plays a large part, the combination of the productive hour and machine hour plan, confining machine hour expense to depreciation, maintenance and power to operate, and including all other items in the productive hour rate.

The period over which a rate of percentage is figured and subsequently applied is very important, especially where this rate is used in estimating and pricing work. In some cases it is changed from month to month, in others adjustments are made annually. Where the rate is apt to change often, the rate to use in estimating and pricing should be changed correspondingly, since it is obviously incorrect to attempt to obtain orders on a basis of last year's high burden rates if this year's rates are materially lower. It is, of course, just as inaccurate to secure work at a low rate which existed in previous years when the present rate is high and expect next year's work to earn the extra burden expended this year.

As a definite gauge of the burden rate, and a means of stabilizing it, it is suggested that an average for the twelve previous months be established each month in all cases. If this comparison shows that the rate in use is running consistently above or below the average, a change in the rate is justified.

## CHAPTER XXVII

### COST DATA COLLECTION AND PREPARATION

**T**HE EFFECTIVENESS and reliability of operating cost data depends almost entirely upon whether or not each item is charged accurately to exactly the same account each time it occurs. After the classifications have been satisfactorily established for the charging of each labor, material or burden item, only half the distance toward accurate and reliable operating cost statements has been covered.

It is still necessary to establish and enforce instructions that will assure correct charging to these classifications and accounts.

It is very unfortunate that this necessity has not been recognized in operating cost accounting as it has in commercial accounting, where it is the usual procedure, when opening a set of books to establish certain accounts, and standard practice instructions to insure that certain items will always be charged to certain accounts.

This is not true in cost accounting as yet, and we still find in a great number of cases a specific item charged to one account one day, week or

month, and to another in the next period. This, of course, makes it impossible to make comparisons with any degree of confidence and always leaves an element of uncertainty in the conclusions drawn from an analysis of such cost data.

This condition only emphasizes the necessity for supplying explicit instructions to all individuals responsible for the distribution of expense items so that after the correct classification of each item has once been decided upon, there is no need for the exercise of individual judgment.

The value of this assurance in cases where the clerks making the distributions are frequently changed will readily be seen. The instructions are useful for the education of such individuals, aside from their primary value of eliminating the making of independent decisions in individual cases, which may or may not agree with the standard practice and policy of the firm.

Charts are prepared for blue printing, one covering labor items, one covering material items, and a third covering burden items.

On the labor charts, after an analysis of one year's labor distributions, including both direct and indirect labor, all the various descriptions of the labor performed are listed on the left-hand side in alphabetical order. This includes descriptions considered authoritative for general use, as well as phrases in "shop" terminology which are used in the factory or plant.

At the top of the chart are shown, each in a

separate column, the various accounts or classifications, both direct and indirect, which have been established for the distribution of these labor items.

If symbols of any sort are used to describe these accounts, they may also be shown at the top of the various columns.

Opposite each description of a class of labor, under the proper column, is indicated the account to which that labor is properly chargeable. This is indicated by the insertion of an operation number as a sub-classification, if direct wages, and by the symbol "X," indicating "Expense," if indirect wages.

The material instruction chart is made in the same manner, except, of course, that the materials, both direct and indirect, are listed in alphabetical order along the left-hand side of the sheet. In other respects it is exactly the same.

The burden expense charts are really complete descriptions of the items included in each burden account, and show all distribution percentages which may be used to proportion such burden accounts.

Beside the value suggested above—their use for instructions to insure consistent and accurate distribution—these charts have another distinct value for reference by all executives and individuals who use the cost statements.

If it is desirable to analyze the total amount of an account as shown on the cost statement, it is possible, by glancing down the column represent-



ing it, to trace each separate item included. In this way the responsibility for, or causes of increases or decreases, can be traced more readily.

Back of the prompt publication of a newspaper on the date and hour specified, there is a great deal which the average reader does not realize.

Chief and foremost among the factors which go to make this prompt publication possible is the complete preparation and anticipation of every bit of work which can be done previous to the hour of issuance of the periodical, leaving for the last minute only work that is necessary for the insertion of such last-minute news items as must be included to make the publication up-to-date.

Most of us have heard the term "make-ready" intimately used in connection with a newspaper office. This in itself is an expression of the preparation, the gathering together of material, and the building up of a newspaper by the collection and addition of current items.

We are told that the modern daily paper has an immense collection of photographs and lead or copper plates of individuals, buildings, vessels, cities and places of all kinds, carefully indexed, awaiting the time when they may be required to illustrate a news item and add the interesting and final touch to the story. Some may never be used, but they are ready for use if the opportunity ever offers.

If not all of us have seen a newspaper office immediately before publication, we have at least



read descriptions of it or seen its portrayal on the stage, and have some idea of the spirit with which its workers are imbued. We have noted how all preparations are made and the climax is reached with the feeling of determination that all items must be included in the paper but that it must also be out on time.

There is a lesson to be drawn from all this by the cost department. Too many times we find in the cost department that no work is done in preparation of cost statements until the time when the statements should be issued and that their issuance is therefore delayed until all this work is done.

Data are allowed to collect through an entire month until the first of the following month, and then only is anything done with them in preparation of the statements. Naturally the statements are always late and the entire cost staff is working one month behind.

In addition, errors that must be checked back, and their causes, are much more difficult to find at this late date, and time is taken for them just when it is most apt to delay the issuance of statements.

We advocate complete preparation of cost data and material day by day and the performance of all work which can possibly be done in anticipation of the final development of the statement, leaving for the last minute only the addition of the last day's data and the necessary recapitulation of items, as well as such ascertainment of costs per

unit, etc., as are necessary to make the statement interesting, instructive and complete.

It is, of course, a fact that some of the work of developing a cost statement must be left for performance until after the last day's work has been recorded, but it is also a fact that a great deal of work can be done during the month toward arranging the data already collected for use in the final statement. It will be found by many upon analysis that a great deal more can be done in this direction than they assumed.

In order to make these preparations, certain things are necessary. In the first place the department must be correctly organized, then work must be properly scheduled for execution, daily distributions of cost and expense items must be made, current totals must be kept, comparative items must be prepared in advance and standard distributions must be established.

## CHAPTER XXVIII

### COST STATEMENTS AND RECORDS

**N**OTICE again that busy newspaper office just before going to press: Every effort is being made to get the latest news into the paper in time for printing; each member of the staff is striving to prepare his part of this information, so that it will be useful to the public, and in its hands as soon after the occurrence of the events as possible, doing its utmost to bring this news to you promptly, glad to save you a minute.

The good newspaper prints news on current events, arranged with proper headlines, so that the most significant information almost stares you in the face.

There are definite hours scheduled for printing, and every last scrap of copy must be in by the proper hour and minute. The managing editor has for his duty, among other things, the responsibility of looking after the verification of the facts to be printed. The news must be reliable.

Our ideal of a cost department is one organized to function like this busy newspaper office. The various cost statements it issues, whether daily,

weekly, monthly or periodically, should be planned for publication at definite hours and dates, just as the newspaper is planned.

As in the newspaper, also, the information these statements contain should be the latest news on costs, brought up-to-date as closely as possible to the publication hour or day.

They should be arranged like the newspaper, so that the most important and significant points can be ascertained first and quickly, and further details can be secured if desired.

It is, of course, essential that the cost news be reliable, and this is probably where many cost statements, like not a few newspapers, fail to give satisfaction. Our ideal cost statements, like our favorite newspaper, must be published regularly, and on time. In this day of highly developed journalism we would hardly dare to be found reading a newspaper twenty-four hours old. Every executive reads reports of all descriptions that are published in his favorite periodicals. This news may cover his favorite pastime, sport or hobby, and the subjects in which he is most interested, or it may refer to matters in which he has only a passing interest. In all cases he demands that it be reliable, complete, prompt, up-to-date and regular.

Why should he not take the same interest in news about that which is his highest interest—his business? And why should he not demand the same degree of reliability, promptness, regularity and accuracy?

Some may argue that cost statements are, at best, cold and uninteresting. We suggest that they can be made interesting by comparisons of various kinds, and by indicating connections with live operations, occurrences and events.

Cost statements properly prepared are inspirational, reporting accomplishment, and urging on to still better results. They can give much pleasure to the man who is really in the game. They can give the satisfaction in achievement, the encouragement to success and the guidance for future activities.

Unfortunately they may, if sufficiently neglected, report many a pathetic and pitiful situation, and even a tragedy. Therefore, our comparison of the cost statement to the newspaper.

The value of cost statements increases or decreases in proportion as they are much or little used. Only too often are they considered merely a record of certain monetary transactions, or a verification of various expenditures of money. It is true that they record and verify these expenditures, but they record only to build the foundation for a series of analyses and comparisons, and verify only to insure accuracy in the data used. When correctly used they do more than all this; they plan, guide, help to control and finally show a report of results accomplished.

There are vast numbers of more or less complete and instructive cost statements passing into oblivion month after month, carrying with them



inestimably valuable lessons for future guidance. A part or all of their value is absolutely lost because they are considered simply a record of past performances which cannot be changed and, therefore, deserves no further consideration.

Another point to be considered is the average executive's lack of time to use these cost statements for all they are worth, and benefit by the lessons they hold, even where their value and importance is realized to the full.

We should remember, then, that in the collection and recording of operating cost data and in the development of the cost statements, in order to make them valuable, the work must be done in such a way as to invite, incite, encourage and facilitate the use and analysis of the data secured.

There can be no doubt that in every industrial or commercial enterprise the very nature of the business necessitates concentration on some details more than on others, in order to maintain satisfactory control. It is also true that greater reductions in costs are possible in some localities and divisions of manufacture than in others. There are many cases where the management is particularly interested in some points more than in others. These various points and details which need special attention and are particularly interesting may be certain plants, departments, operations, methods, products, men, etc., all of which can be expressed and described in quantities and values in the cost statements.



It would seem logical, therefore, in order to invite, incite, encourage and facilitate the use of cost figures, to localize expenses and develop complete, accurate, reliable and concise records and data on various expense items in the order of:

1. Their necessity for satisfactory control and management
2. Their value in the work of cost reduction
3. The interest exhibited in them by the management.

A study of conditions will generally point out:

1. Which data should be collected and recorded
2. Which figures should be prepared most completely and be ready for instant use
3. Which items should be regularly and consistently placed before the executive in charge
4. Which information should be tabulated continuously and which may be secured only at intervals
5. Which items should be analyzed and divided into their most minute components and those which may be recorded as a whole.

Any work done with such study and on such an outline should result in a set of statements and a series of files of indexed cost data, in various degrees of completeness, adaptability and availability, from which that information which is most necessary and most frequently desired can be immediately secured, and all other data obtained

with an ease in proportion to the frequency and extent of its use.

It will often be found that owing to changing conditions some details may need more attention for a short time than is usual; the method used in collecting and assembling cost figures should be flexible enough to allow for such concentration without interfering with or detracting from the essential comparison of all other necessary items or the effectiveness of the whole.

It should always be remembered that the man who is to use this data is usually an exceedingly busy person, and probably one of the most essential things is simplicity in the form in which it is presented. For no matter how complete, comparative and prompt the statement, it has no value unless it is sufficiently studied and analyzed.

Statements can often be simplified and made more descriptive by showing average unit figures, costs per hour, or costs per ton for instance, or by showing percentages of one item to other items to which it has relative importance. The form in which the statement is made up should be considered: shall the figures run the length or width of the paper, shall all information regarding a certain operation be concentrated on one sheet rather than spread over a number of sheets, shall most important items stand out clear and separate from less important ones?

## CHAPTER XXIX

### GETTING STATEMENTS OUT ON TIME

**W**E HAVE said in previous chapters that the spirit and ideal of the newspaper publishing office can be used to great advantage in a cost department. We have compared the cost statement to the newspaper; its contents are good only when issued as soon after the occurrence of the event as possible. We have suggested that both must have their headlines or summaries and that both must permit of further investigation into details.

In this chapter we propose to make several suggestions which, if they can be practically applied, will enable the cost statement publisher to get out his cost news on time and regularly.

First, we must assign definite duties and responsibilities to each member of the organization. Imagine the difficulties of a fair-sized newspaper if there were no assignment of duties and responsibilities as to the various kinds of news. Probably the greatest factor in the successful and prompt

publication of the larger newspapers is the complete departmentalization and the definite assignment of responsibility to individuals for material in each department.

So each cost accountant should analyze the kinds of facts which his department must collect and the various methods which are used to collect them. After he is satisfied that there is no duplication of work—and he may be surprised to find a great deal of it—and that correct methods are being used, he can definitely make each individual in the department responsible for certain specific work and the collection and keeping up-to-date of particular data.

This is neither more nor less than the application of several of the most successful principles of scientific management, setting the task, planning the work and defining responsibility.

This process usually results in:

1. The elimination of duplicate work
2. The improvement of methods
3. The development of a regular schedule of issuance of all cost data in statement form
4. The actual issuance of statements on schedule time.

In order to establish this schedule and enforce it, one organization has found very effective the use of a monthly chart.

In establishing the schedule, the work is first definitely assigned to individuals, apportioned so

that it is evenly distributed and taxes no one with more than he or she can do.

Another point which should be watched is the course work travels from one desk to another. As far as possible the work of various desks should be arranged so that the progress on one does not depend on another unless there is a reasonable certainty that the flow of work will be steady and without interruption.

After the schedule has been so established, the chart is made out.

The names of all individuals in the department are listed on the left-hand margin. Immediately following and continuing down line for line are listed the various items of work or "tasks" for which the individuals are responsible. A horizontal line is devoted to each task. Following the description of the work to be done, a series of vertical lines are drawn one after another to the extreme right-hand edge of the chart to provide thirty-one squares, one for each day in the month.

It is assumed that unless otherwise noted each task is to be performed daily. As the work is performed the symbol X is inserted in the square representing the day and on the line following the description of the work. The letter O is inserted for Sundays or holidays unless records for such days are to be collected.

If any task is to be performed periodically, a horizontal straight line is drawn through the square or squares representing the day or days on which



it is to be performed. When the work has been done the symbol X is marked in the square over this line.

If on account of delays of any kind the individual to whom the task has been assigned cannot perform it as required, and another person is temporarily assigned, the latter's initials are shown in the square instead of the symbol X.

The chart is made about 18 inches wide by 24 inches long, with about  $\frac{3}{8}$  inch squares. It is posted on the wall and each individual is responsible for marking up his record.

The advantages readily will be seen. First, the work of the entire department is charted so that it can be studied as a whole. Second, by referring to the line of squares under the current date, the condition of the work of each individual can be noted at any time and plans for remedying retarded work can quickly be made.

The ideal condition is to have the squares following each line up to yesterday's square filled with X's. If this is not the case, the exact number of days behind on each kind of work can be seen at a glance.

The accomplishment of each individual can be judged by the number of squares showing initials rather than the symbol X.

Work scheduled to be performed periodically other than daily is never lost track of.

There was a time when the last day of each month was a day to be dreaded. Every member



of the bookkeeping, accounting and cost departments saw it approach with a knowledge that it meant hard work, overtime, and a monotonous routine of finding errors and locating their causes, and saw it pass with relief.

Fortunately, this is not now so universally true, although it still occurs in enough cases to make it worth consideration.

Mechanical accounting and office devices have done much to overcome this difficulty and we are indebted to their producers for the relief from this "end of the month" burden, either directly by the use of their equipment or indirectly because their sales and advertising activities have influenced us to a more intensive study of the problem and more earnest attempts to seek our own solution.

As a result of all this activity, and of a distinct principle advocated by the office equipment producers, there stands out prominently at least one standard practice which has been generally applied with success.

This is the keeping of current totals on all data in preparation for use at the end of the month; in other words, complete each day as far as possible all calculations and computations, so that the last day of the month, as far as current work is concerned, will be no different from the rest.

Under the old régime items for debit or credit to various accounts, either for accounting or cost purposes, were listed or posted, sometimes daily under the better systems, and under the worst were

merely allowed to pile up so that the information had to be literally dug out of a mass of data after the close of the month.

The newer practice, however, has proved that this is an unnecessarily burdensome method and that particularly with the aid of mechanical devices every item can be credited or debited to the proper account, and the total be secured each day.

The writer has known this to be a practice in operating cost work where upwards of nine hundred different accounts are carried, covering wage and material cost as well as production records.

When it is necessary to show the daily total as well as the current total to date this is done, but when unnecessary, the total for the day is merely added or subtracted from the previous current total and the resulting current total is shown.

It is possible, of course, to devise checks that will insure accuracy and make it unnecessary to show each step in the work. For instance, a total of daily payroll totals to date can be checked with the total of all current totals of the various direct and indirect wage accounts.

There are many advantages in this newer method. In the first place, as indicated above, it eliminates the end of the month congestion. When the last day of the month arrives it is merely necessary to add the last day's work to get a monthly total for use in the compilation of the monthly cost statements.

By the use of various checks, as instanced above,

errors are caught and corrected daily, and at the expense of much less worry and work than if left to the last minute.

There is another distinct advantage in current totals. Daily or weekly statements can be issued showing information totaled up to date for the month. This stirs up a certain amount of interest particularly when they are compared with similar periods in previous comparable months. Further, this interest is created when time still remains to do something constructive to improve the cost accounts or production items that do not compare favorably.

The monthly cost statements can be issued days, and even weeks, earlier than under the old plan, and are, therefore, more valuable for use. Covering recent activities, they can be more intelligently studied, and are productive of better results.

## CHAPTER XXX

### SYMBOLS AS AN AID

**T**O MINIMIZE the labor and simplify the operations necessary to secure records, descriptions and instructions, several different methods of symbolizing by operation, equipment, department, product, etc., have been devised and put into successful use.

Chief among these methods are found three which will be briefly described.

The first method, known as the mnemonic symbol system, consists of devising combinations of two or more letters which suggest at sight the various departments, operations, machines, etc., but which are descriptive and original enough to avoid being mistaken for one another. For instance, the accounting department may be symbolized by ACC, the production department, PRO, and the purchasing department, PUR. The number of letters in the symbols distinguish between classes. In other words, operation symbols may have two letters, department symbols, three, equipment symbols, four, etc.

This system is effective and simple where it is adaptable, inasmuch as no key is necessary in its

application. Its disadvantage is that where there are many classes or many items in each class, five or at the most six letters are needed to make each symbol original and comprehensive enough. Thus it becomes cumbersome, complicated, and confusing, and soon resembles "red tape."

The second and better-known method is the purely numerical or alphabetical system with all its combinations of the figure or letter. Possibly the most popular combination is the alternate letter and figure. For example, the first letter may represent the department, the number the operation, and another letter the expense classification, as material or labor. Another adaptation of the numerical symbol is that known as the decimal system, in which the position of a figure denotes its class. Thus 103 might represent the third expense account chargeable to department number one, and all accounts chargeable to this department would be represented only by symbols of numbers between one hundred and two hundred.

These methods employ a key, and if allowed to develop into complicated combinations, become very much harder to remember than the mnemonic or suggestive symbol.

The third and most effective method combines the two systems already described, using the mnemonic system until the symbol becomes too large, and then adding numbers or alternate numbers and letters, before or after, for other classes or further variations in a class. Thus the burden

labor account chargeable to assembling in the fourth department in a plant might be symbolized BL4AS.

The use of symbols greatly facilitates the collection, recording and filing of cost data, and greatly aids comparison and analysis. It is advisable wherever practicable.

No two sets of symbols are exactly alike, and many original and effective combinations can be devised to fit the individual case.

Symbols represent in cost finding what stenography does in present-day correspondence.

In the first portion of this article several systems of symbols have been briefly described and it remains only to point out the items to which one kind or another can be applied in the building of an operating cost statement:

- Plants and Buildings
- Departments and Sub-departments
- Workmen
- Machines and Equipment
- Operations
- Materials
- Supplies
- Product
- Expense Accounts Labor
- Expense Accounts Materials
- Expense Accounts Burden

In devising symbols for these items it is advisable to place those characters first in the symbol which



represent the main items and accounts and then follow with those representing the sub-divisions. This will help to make the relation between the various symbols comprehensive, and will aid in memorizing them.

It is also necessary to keep in mind the inevitable additional items to be symbolized and to allow for sufficient expansion.

The introduction of a symbol system should be deferred until it has been very carefully studied and developed; once it is applied, the fewer changes made in it the better.

In consideration of the development of electric tabulating machines it is recommended that consideration be given to the establishment of symbols by the numerical unit plan in which certain specified unit figures are set aside for the various designations. The manufacturers of any of the tabulating machines will be very glad to help in the definite development of this plan.

## CHAPTER XXXI

### GRAPHIC PRESENTATION

**I**T HAS been said that the eye is the window of the mind. Since in all our daily use of information and data relative to our management problem we are anxious to bring it into our mind as promptly as possible, it is natural that we should apply to this problem the best means to convey this information through these windows. Hence we turn to the new developments in graphs, charts and the various means of presenting relative data in picture form, for real assistance in so doing.

No matter how complete and detailed cost statements are, their presentation can be much improved through the use of graphs. In fact the more detailed they are, the more valuable the graphic presentation of outstanding items. Graphs are to cost statements what illustrations are to a newspaper. They enliven otherwise dull reading matter. They emphasize given points. They demand attention on strikingly comparative items, and have many other distinct advantages.

Costs are valuable only in proportion to their

use. This means that it is desirable to bring their lesson forcibly to everyone concerned. Graphs offering a simple method are understandable to minds which could never grasp the complexities of long, detailed cost statements.

Since the aim is to bring the picture to the mind as quickly and as comprehensively as possible, and inasmuch as in charts and graphs a great deal of information is concentrated and clearly portrayed in a small space, a picture remarkably comprehensive in details can be brought directly to the mind through their use.

Ideals of good cost presentation are comparison, relativity, proportion and ratio. Graphs properly scaled bring out these comparisons and proportions in a manner which cannot be done in any other way. Take, for instance, two items, one \$438.96, the other \$274.35. Compare them as set down in numerals. Now draw a line two inches long representing the first, then another one and one-quarter inches long representing the second. Note the immediate sense of proportion and ratio you get from these two simple lines, which no end of gazing at the two figures would give you. Graphs do facilitate these comparisons. By wise use of colored lines, different types of lines, and shadings, comparisons and distinctive relationships can be easily shown which it would take the mind no end of time to assimilate from tabulated statements of figures.

Most executives abhor detail; of course, there are

those who have a great eye for it, but as a general rule it is irksome. Those executives will get more from a glance at a chart than they can ever hope to get from a list of figures, and what is more important, they look at the chart or graph while they would shuffle the statement around until it is finally filed in the last drawer of their desks.

In the routine of our work we are all inclined to get into a rut, even as to the dollars and cents results in our business. If the story is told us in cold black numerals, in variations of only ten characters, we may find it difficult to detect even the most startling facts. Graphs offer opportunity for emphasizing noteworthy and startling facts vividly by use of no end of colors and characters, and force the lazy minds of many of us to "stop, look and listen" at the danger signs.

Graphs also offer a means of overcoming the one real objection to the wide publication of cost data so often desirable in order to inspire and maintain the interest of the largest possible number of people who can affect costs in a plant; this is the reluctance on the part of many chief executives to give out cost statements in terms of dollars and cents for fear of abuse of the data thus confidentially issued. Graphs indicating relative lines can be issued generally, while keys can be furnished only to those who are especially trustworthy, who can in turn interpret only to those who are sure never to abuse the confidence placed in them. Graphs in simple form spell real human interest to

many who would hardly ever be stirred by cold figures.

Among many items that graphs can be drawn to show are the following which offer a suggestion of their wide scope:

Operation costs

Expense items of all sorts by classes, totalled and in groups

Unit production costs

Hourly burden rates

Burden percentage rates

Material costs by units or classes

Actual items as compared with standards set or budgets

Any items compared by days, daily and to date, monthly compared with previous months, averages of all sorts, compared with previous monthly averages and, of course, annual comparisons of all sorts

Departmental comparisons

Wage rates by operations, departments and classes

Machine hour rates by classes and groups.

Beside all the above there are dozens of items regarding production progress which can and should be shown graphically.

Ingenuity will point the way to many interesting developments in the way of graphic presentation of cost data. As a matter of fact it is recommended that the means of presentation be changed every

so often if for no other reason than to attract attention at certain desirable times to specific data.

Beside their use in the publication and presentation of costs, graphs and charts will be found useful in facilitating the collection and compilation of cost data. For instance, machine hour rates, burden percentages and wage rates can be made up in chart form from which totals can be easily picked and used.

They are also valuable in the development of standard practice instructions in showing the procedure of forms, the routine of classification and distribution, the responsibility for costs. An interesting experiment was made in this connection by co-ordinating the organization chart of a plant with the entire cost classification, tracing responsibility for each class of cost to a given individual in the organization. The analysis thus provided was valuable and fruitful. Charts and graphs have all the advantages for instruction purposes that were enumerated as those attendant on the publication of cost facts in other forms.



## CHAPTER XXXII

### THE COST DEPARTMENT ORGANIZATION

**M**UCH HAS been written and said about the cost of keeping costs. Varying statements have been made as to the number of people necessary to collect costs and keep records of production for different numbers of workmen.

Unfortunately, these figures have little significance, since, in the first place, cost principles are far from standardized, even in a given industry; in the second place, the functions and responsibilities of the cost department vary in different organizations, and are, therefore, hardly comparable; and finally, the methods of performance are so dissimilar that it is difficult to draw any conclusions.

The matter of principle consideration in this discussion is not so much the question of how much it costs to collect data for a given concern or a given number of men employed, but rather what returns are received from the money expended for this purpose.

Cost records can be secured for almost any amount that a company is willing to spend, but it must be understood that they will vary in

accuracy and completeness in proportion to the amount invested. As in everything else, it costs money to have work done right.

Therefore in deciding upon an organization for the collection of cost records it should not necessarily be considered on a basis of how many persons are used by some other company employing approximately the same number of men, but rather what work is necessary in order to obtain a definite cost service, developed to the degree of accuracy and completeness justified by an intelligent estimate of probable returns from the preparation and use of this data, and established after a careful study of requirements.

There are then two extremes to be guarded against. There is the danger, first, of economizing to such an extent that the information collected is so inaccurate and incomplete as to make it useless, and the money spent, however little, wasted.

There is the second danger of amassing data and tabulating figures in so large a volume and to such a degree of accuracy that they become burdensome, full of duplication, difficult to use and, therefore, discouraging to use, wasting at least a portion of the money spent.

We suggest that every manager and executive responsible for the accumulation of operating cost data examine his cost organization from these two angles, remembering always that cost information is not collected for the joy of collecting it, but for the use that can be made of it.

There is, however, one valuable and necessary quality of cost data which varies not so much with the amount of money spent on the work, as with the method of organizing the work; in other words, through the correct assignment of duties rather than through the expenditure of more money.

This is the immediate availability of the information, or its "up-to-dateness." We believe, in fact, that it costs more not to have data up-to-date than it does to have it so. And furthermore, this is a feature which has but one extreme to be guarded against—the danger of not doing it enough. It can hardly be overdone.

In organizing for this purpose there is at least one rule which can be followed to very good advantage. This is the separation of the work of current collection of the data from that of periodical tabulation.

For instance, if the individual or group responsible for the daily collection of data is also responsible for the making up of the monthly statements at the end of the month, one or the other will suffer, with the result, under either alternative, that both the current and periodical records run behind and are stale and less valuable when tabulated.

If studied carefully, the organization can usually be arranged and the work assigned so that these two functions do not interfere with each other. It should be possible to do each day all necessary tabulating of the previous day's records, and to continue it uninterruptedly at the close of the

month or other period when cost statements are made up.

Where possible it is usually desirable to have these two functions performed by different individuals or groups. However, where the total work to be done under both functions is small and really amounts to no more than enough for one individual, the work should be arranged so that a definite part of each day is spent on each function, in order to keep all data, both current and periodical, as up-to-date as possible. Or still better, these two kinds of work might be executed by two individuals, each spending part of a day on this work, and part on other duties.

When the force is large enough to require the supervision of a head or chief cost clerk, it will usually be found desirable to assign the periodical development of statements to him, and to leave the majority of the general group free to uninterruptedly continue the current collection and preparation of information for his use.

We stated earlier in this chapter that we believed it costs less to keep cost data up-to-date than not to do so. At least one logical and obvious argument will help to substantiate this statement. Cost information must be checked for errors if it is to be correct. Where it is tabulated promptly it is certainly very much easier to detect and correct errors, and thus to save work which is in itself a very costly part of the preparation of operating cost data.

## CHAPTER XXXIII

### THE COST ACCOUNTANT

**WE** ARE often asked the question—"What kind of a man makes the best cost accountant?" We will attempt to point out certain requirements as well as certain other desirable qualifications.

Great progress has been made in operating cost accounting during the last ten years, until this function now holds a much more important position in the industrial organization than heretofore. This has, of course, made it necessary to use a higher type of man for the development and maintenance of the work.

Time was when a clerk of little more than ordinary intelligence could qualify for cost accounting work, provided he was accurate at figures, wrote a plain, legible hand, and had an aptitude for detail. The modern cost accountant, however, in order to fully handle our modern cost systems, and get the biggest results from them, must have in addition to these qualifications, which are of minor importance in these days of highly developed mechanical computing and typewriting equipment, many other



very important qualifications. Let us consider them in sequence.

In the first place he must be more than an ordinary clerk. He should have a broad viewpoint. He should possess executive ability. Modern cost accounting requires that the accountant deal with executives in the organization on a more or less equal basis. He should be able to make others recognize his position in its correct importance, and be able to maintain it in its relation to other functions in the industrial organization. He is usually required to supervise the work of one or more assistants and clerks.

He should by all means and probably above all, be analytical. Analysis of cost data for its use in guidance and control has in itself been a leading factor in the elevation of cost accounting to its present position of importance. The cost accountant should, therefore, have the ability to analyze cost information until he has brought to light every pertinent fact and exhausted every possible means of securing further knowledge from the available records.

This requirement is probably the main reason that so many members of the engineering profession have been successful in this field, not because of specific engineering education, particularly, but because they have been trained as a rule to analyze to minutest detail.

The cost accountant must also be aggressive and progressive, because it is often necessary to first



force the collection of certain cost records, and then force the use of this information on those for whose guidance it is provided.

He should have considerable initiative and originality, inasmuch as a great many of the facts presented should come from him unsolicited. He should have a talent for comparison, because through comparison all operating cost data is made more effective.

He should be resourceful, inasmuch as he may often be required, or himself find it necessary, to provide certain data different from or in addition to regular statements. Unless he is awake to every opportunity and can get the most out of available records, he may either do much unnecessary work or fail to secure the information altogether.

He should have imagination in order that he may visualize and understand the conditions which are portrayed by the cost data which he develops.

He should have constructive ability because the cost statement is really a structure built upon the foundation of correct unit cost figures.

Other essential qualifications are an appreciation of values, reliability in limiting the use of important information to those who are authorized to use it, orderliness, and finally, loyalty and honesty so that he will bring up facts regardless of where praise or blame may fall, without permitting personal prejudice or preference to influence him.

## CHAPTER XXXIV

### RELATION BETWEEN COST AND EFFICIENCY DEPARTMENTS

**T**HERE is still a great difference of opinion as to just how cost work and research or efficiency work are related. In some organizations we find two distinct divisions, entirely separated, handling these two functions, while in others they are at least related sufficiently to insure co-operation.

We will first briefly outline our understanding of the purposes of these two functions.

Cost finding proposes to record information, first as to actual production and second as to classified costs of production.

This information is tabulated as to men, machines, operations, departments, classes of commodities, kinds of products. Such tabulations should be complete, in that they cover every item of expense, and, therefore, can be collected only in sufficient detail to permit of their practical use.

Even in the most completely developed cost system, therefore, it is impossible and impractical to have intensive analysis.

Research and efficiency work, particularly that section which has to do with standardization of equipment, methods and processes, attempts to record data as to production, as well as costs, in a way similar to that done under cost finding. Also, it is usually found necessary to classify this data as to men, and machines.

Up to this point a distinct similarity will be noted. However, the difference lies in the fact that in order to successfully carry on the efficiency researches it is necessary to tabulate this information from very minute records.

Because of the possibility in this work of separating a given operation, process or item of expense from all others and studying it for a short time, it is possible and practical to secure very detailed and intensive analyses.

If we are correct, therefore, are we not justified in a further statement that efficiency research work is after all only an intensive cost-finding or vice versa, that cost finding is merely a generalized efficiency research?

There is a distinct necessity for both, for while there is a similarity in the work they perform, there is an absolute difference as to the results they should obtain.

Briefly, cost work offers a continuous general control of all items indicating possibilities for general improvements. Efficiency research work offers an intensive temporary control of one or a few items indicating possibilities for great and

complete improvements, and better still, standardization.

Both classes of work are statistical by nature and require for their performance individuals with similar ability and qualifications.

With all the above true, it is our opinion that there is a distinct advantage in arranging these two functions of control so that the work of each can be arranged to facilitate the work of the other, and to secure the maximum value from both.

For instance, cost records, if arranged with this ideal in mind, can usually be tabulated so that they offer the efficiency man a very complete foundation for his intensive tabulations and researches covering a given operation.

In like manner the efficiency man in making his intensive research of a given operation, if he keeps in mind the requirements of the cost division, can secure information which will promote the development of analyses in that division.

## CHAPTER XXXV

### USE OF COSTS FOR CONTROL

**W**E WILL soon look backward to the time when cost data, especially operating cost information, was considered a luxury rather than an essential; something nice to have but which we could easily get along without. Manufacturers are fast realizing the absolute necessity of reliable factory costs, storekeepers are delving into their operating expenses, and many executives are considering cost statements their most important tools.

That costs have many varied and important uses is therefore evident. Just how valuable they are in each organization depends upon the particular circumstances, but in a general way we can classify the principle uses of cost data under four headings as follows:

1. Cost and Production Control
2. Standardization
3. Financial
4. Pricing and Sales.

By control we mean the watchful management and supervision of all factors affecting the opera-

tion of a factory or plant, in a manner that will not allow any increase in cost of operation over previous cost of operation under similar conditions. To properly control, the executive should know exactly what circumstances have made an increased cost necessary or a decreased cost possible.

To be able to control in this manner we must have available for careful analysis cost statements explaining operating conditions of previous periods, and resulting operating costs, and the same information regarding the current period. In other words, we must know what has been, what should be, and what is.

We often note with regret hesitation of some executives to furnish the subordinates, upon whom they depend for control, with the information which points out the results of such control. While we realize the importance of using discrimination in divulging the tell-tale figures of a business, we do believe it is essential that enough information be given each man in executive control of any operation to permit him to intelligently handle his work. This should always be possible. Often it may be done by furnishing information which, although complete for the particular department or section in which the subordinate is interested, does not alone give the complete descriptive data regarding the business as a whole.

If a man is not considered trustworthy enough to receive data on the result of his expenditures, he is not good enough to make such expenditures,



and we emphasize again—tell the man what has been, what should be and what is regarding that which he controls.

Statements and cost data for use in controlling costs should be arranged so as to point out easily and quickly just which individual, group or department is responsible for each item. This is necessary to allow the executive to take appropriate action with a unit when an item shows an unnecessary increase. Every item of cost and expense should be easily traceable to its origin. Files should be available with all data from which cost statements have been compiled, to permit the most thorough analysis when this is found necessary.

Inasmuch as much of this analysis is made by comparison, statements should be profusely illustrated by comparisons, although not to an extent that makes them complicated and too difficult to study. For instance, comparisons using a month as the period of the statement, can be made of the present and the preceding month, of the present month and the same month last year, or of the present month and the average of any preceding group of months. The value of comparisons should not be underestimated.

That the control may be most effective, cost information should be furnished as soon as practical after the occurrence of the operations it covers. An executive can work best with live data. Certain information is available each day on the preceding day's work. If such information

is useful for control, it should be furnished daily. Other items are available weekly and monthly. They should be compiled and issued for use promptly.

Whatever the means, cost information, and especially that used for control, must be presented in as simple and descriptive a form as possible, so that it can be quickly and thoroughly studied and analyzed.

The method of applying this knowledge to the problems of cost reduction varies to a certain degree with the type of organization. In all organizations, the executives who control costs should also use all available cost data to aid them in deciding upon changes necessary to lower costs. We find, however, in the new type line and staff organization developed under scientific management, a separate and distinct staff of men usually termed the efficiency or betterment department, provided in addition to the line executives, to specialize on cost reduction. It is probably because of the fact that these men found it absolutely essential, in the accomplishment of their work, to obtain accurate, reliable, prompt and complete information regarding past and present costs of operations under various conditions, that operating cost accounting has in the last few years properly taken its place as one of the essential factors in good business practice.

If it is found after careful study that costs compared by the same correct unit vary greatly by

periods, being high at one time and low at another, it is logical to believe that if conditions had been uniformly correct the costs might have been at the low level during all periods. An investigation should be made to discover what was responsible for the high points and steps should be taken to prevent the recurrence of the causes if possible. If they cannot be eliminated entirely, it may be possible at least to reduce them.

Often it is possible to compare costs of operations of a similar nature. It may be found that an operation is being performed in one department under certain conditions more cheaply than the same operation in another department under different conditions. Steps should be taken to correct such conditions. Even where operations are not exactly the same, they may be compared when carefully analyzed and the correct proportion of the costs of one to the other may be determined. If this proportion is not correct, further investigations should ensue, and action should be taken to make it right.

Operating cost data should also be arranged so that they quickly and accurately point out the results of changes made in the various operations. After all, the acid test of all work for cost reduction is the cost statement which shows whether or not the work has had the desired effect. If not, it should be known at once so that further investigation, study, and effort can be applied. If it has been effectual, this should also be known imme-

diately, for knowledge of results accomplished acts as a stimulus to further efforts. It sustains interest in the work and makes it a game with the cost statement as the score, and the contestants ever striving to improve upon their previous records.

Because of the use to which costs are put, data above all other things must be truthful. There should be no opportunity for deception either as to the success or failure of changes made in operating conditions. The knowledge that the cost statement will truthfully and fully show the results, encourages and in fact makes absolutely necessary a careful and analytical consideration of all proposed changes before they are put into effect.

Deliveries at any cost! This is the cry from all directions just as soon as prosperous conditions obtain in business. The sales department, the jobber, the wholesaler, the retailer and the customer all join in a chorus with this as the theme. It is logical and natural that they should. At such times sales usually depend entirely on the amount of material which can be delivered in or by a given time. To make such deliveries these materials or products must be produced by the given dates and thus it becomes a production department problem.

With this problem confronting it, with pressure being brought to bear on all sides and with no limitations set as to costs, is it right for the production department to take up this cry and make it a basis for future execution of work at any cost?

Emphatically—no! Even if it attempted to set aside all consideration of costs it would not find this a solution. Money itself cannot always solve the problem of time. This is probably the one great lesson which operating and production cost data have taught the production department.

And when money can solve the problem; when by the addition of new buildings or new equipment or new men the production can be increased, is it correct to spend this money until consideration has been carefully given to the effect of this expenditure on costs generally, not only during present conditions, but also during the period which the future will surely bring, when conditions will be normal, or, worse still, below normal?

Good business conditions may last a month or a year, but the future has no ending and it brings uncertainty.

Therefore, the conservative and careful executive when considering deliveries and possible expenditures to secure such deliveries, carefully notes the effect on present and future costs. He does not disregard cost at present because he feels entitled to at least as good a profit as was obtainable before. He does not disregard future costs because he knows that if he does so now they will inevitably come to the foreground when conditions change.

He, therefore, insists that production and delivery be not made at any cost, but at a cost which will allow a present profit justifiable for present



conditions, and large enough in addition to make his investment for extra production and speedier delivery worth while, even though the future years do not bring a continuation of prosperous business conditions.

The failure to consider these factors sufficiently, or at all, before making such investments may be the cause of losses in future and probably of not a few bankruptcies.

When considering these problems: the question of better deliveries from existing facilities, when additional expenditures will not help, the effect on present costs of additional investments to secure better deliveries, and the effect of such expenditures on future costs under less prosperous conditions, the executive should find operating cost data and particularly that which have to do with production efficiencies and unit production costs of invaluable aid. He should find great use, especially, for data which show the effect of varying unit productions on overhead and fixed charges.

Inasmuch as delivery usually has as its chief factors time and certain total unit productions within that time, and as fixed charges and burden expenses must in most cases be distributed according to time and vary with it, the problem of ascertaining the effect of the first upon the second is most important.

With proper records collected and tabulated, this is not very difficult.

Such records should be classified so that those



items which are affected by the time element can be readily selected, so that all past performances of various producing units can be compared and the unit production of each for a given period be ascertained, and so that the effect of an increased overhead or fixed charge burden expense can be noted on a stationary production, or vice versa. The records should also cover and completely describe as many different conditions as have occurred, so that they may help in prophesying intelligently regarding hypothetical conditions which it may be desirable to assume.

It is a very rare occurrence when a plant is taxed to its maximum capacity. Therefore the production manager seldom has any precedent to go by when, under prosperous conditions, he is asked to make statements regarding just how large a volume can be produced.

It is possible that, although certain production can be secured, the unit cost will be thereby increased. It should be a part of such an estimate to show the effect of various increasing productions on operating costs.

When no data are available, usually the foremen, shipping clerk and other members of the organization are taken into confidence and an attempt is made to get down to facts regarding just how much this or that machine can do. Those officials may be very optimistic, may have been impressed at one time or another by an unusually good showing

during a short period, and may base all their opinions on such impressions. The result would be, of course, that if business were taken on such a basis the plant would soon find itself overtaxed.

On the other hand they may be very anxious to make their responsibilities as light as possible, and to relieve themselves of future burdens may base their statements on poor or at best on average periods, with the result that either new and unnecessary equipment and buildings are added, or valuable business is turned down with a proportionate loss of profit.

Regardless of whether or not the operations have been standardized, regardless of whether or not the plant has reached its highest efficiency, regardless of whether or not a plant is taking care of all the business possible, sufficient data should be available through operating cost accounting to make an intelligent estimate of maximum capacity with a fair degree of accuracy.

For this purpose operating cost data should be collected which will point out the best productions of each and every productive unit, under various conditions, as well as the average and poorest productions. The effect of these productions on other factors and operations should also be pointed out. For instance, it should be clearly shown whether or not the shipping facilities took care of a maximum production satisfactorily and just as cheaply per unit, as of a lesser production. It

should be shown whether or not receiving of materials was hampered or more expensive when shipping was greatest.

Information should be available as to how many operating units of one kind are necessary to keep pace with a certain number of units of another kind. For instance, the proportion of assembling time on a given product to the machine time on that product.

This information must be secured covering all the various actual conditions. It is not satisfactory to use the best cases only, for this would serve little better than the statement of the optimistic foreman. Nor can it cover the minimum production period alone. Therefore, it is best to include such information in the continuous collection of operating cost data so that all possible conditions can be analyzed.

It should be remembered that when a large demand is made on production, it hits in equal proportion each and every unit of production. Therefore, data should be collected covering not only the main operations and productive units, but each and every related one as well, because often under stress of very large productions, weak points show up where they are least expected.

Data should also be classified and made quickly available, for as a rule time is an important element when a decision is required as to possible maximum capacities.

With executives waiting, it should not be necessary to dig through great masses of unclassified, unfiled and untabulated data to secure this information.

## CHAPTER XXXVI

### USE OF COSTS FOR STANDARDIZATION

**I**N DISCUSSING the value of operating cost data for use in standardizing operations, materials, equipment, designs, production and costs, we will separate our consideration into three distinct divisions, each one denoting a logical use and purpose of this information. In the following they are set forth in the sequence in which they can and should be properly applied.

1. Use to indicate points where standardization is necessary, possible and profitable
2. Use to measure currently results of partially completed work of standardization until standards have been attained
3. Use to assist in maintaining the standard set after the work of standardization has been completed.

We do not suggest that standardization, betterment work, or the work of developing efficiency cannot be performed without the aid of operating cost data. It can and has been successfully done

many times. There are even cases where the collection of operating cost data was the result of standardization instead of the cause of it.

It is an undeniable fact, however, that this work can be started much more intelligently, and can be completed with greater rapidity, where reliable, complete and accurate operating cost figures are available.

Just as the experienced mariner, although he can often reach his goal by knowledge of the shore line or signs in the sky, finds that with the aid of a compass and proper charts he can steer a straighter, more direct and therefore quicker course, so the industrial expert, although he can often obtain results without operating cost data, finds them an invaluable aid in more quickly and satisfactorily reaching his goal—efficiency.

When commencing the work of standardization of an industry, one is confronted with a mass of units represented by departments, operations, equipment, men, material and methods, each varying, first, as to its relative importance in the whole, second, as to its effect on all or some of the other units, and third, as to its relative actual efficiency and possible efficiency.

In order to make an intelligent start and obtain the greatest results in the shortest time, it is necessary to choose from among all these units, for first attention, those which hold the position of greatest importance in the whole, or in other words those which represent the greatest expenditure of



money. It is further necessary to locate those which, although not so important in themselves, have a very decided effect on other units, many in number or of individual importance, and which in some cases may be actually retarding the progress of the entire organization. It is also very essential, of course, to start work on those units which are in the worst condition, and which have the lowest efficiency.

Nothing is more helpful, therefore, when we are ready to begin this work, than complete operating cost information, which should, if it is completely and reliably compiled, tell us which department is most important, costs the most money to operate, costs more than it should when compared with similar departments; which gives us similar information regarding operations, as well as machines; which points out whether material or labor cost constitutes the greater proportion of production costs; which gives us a comparison of direct labor with burden labor, pointing out the proportion of one to the other in such a way that we can decide which requires attention first.

We do not maintain that cost data alone are necessary. Costs must, no doubt, be supplemented by further information secured from investigations, as well as by experience and ability to analyze and interpret the information furnished, but they do provide a very satisfactory basis from which to work.

We now come to the consideration of the second use under this heading—to measure currently results of partially completed work of standardization until standards have been attained.

For this purpose cost data, properly compiled, currently collected, and correctly indicative, are very valuable, because they furnish a record of the effect of each change or move made to help in planning further work, and for future guidance. From such data it should be possible to note at once the effect of any change in mechanical equipment, any rearrangement of appliances, any changes in methods, whether manual or mechanical, as well as the effect of all changes in shop practices or systems, such as planning and dispatching methods, order systems and material transfer plans. Data should also show the effect of different plans of wage payment, bonus or premium incentives, profit sharing schemes and the like.

For all these purposes information should be promptly available for reference and should be carefully classified so as to point out separately the effect of each and every change mentioned above on every item of cost, as well as on the totals. The effect on totals is particularly necessary, inasmuch as a change may show a decided saving in the particular item of cost which it affects, but when the total is considered it may not prove an economy, because of its effect upon other

items of cost. In the same manner the change may not seem very effective when considered from one particular cost standpoint only, but the effect on the total cost may make it wholly desirable.

With a prompt knowledge of the results being obtained, it is possible to push most strenuously for completion that work which is bringing the greatest immediate returns and to introduce the same sort of changes in other directions where they will prove similarly effective. It is equally as important to be warned immediately of any false moves which have been made so that the effect does not become too far-reaching before the necessary readjustments are made.

Experiments are inclined to be very costly and each step should be taken with a complete knowledge of the effect of the last. We should build our standards on a solid and substantial foundation of known and proven facts. In the majority of cases, changes require an investment of money and it should be shown just as soon as possible after the change has been made whether or not the investment was profitable, if for no other reason than as a guide when making further investments of a similar nature.

A current knowledge of the good results obtained from the work of standardization proves an inspiration to those engaged in this work. There is a great deal of satisfaction in seeing a plan developed at a cost of considerable study, effort

and thought work out as was intended. It is part of the reward, and quite as important as the monetary compensation. It makes the work interesting and to a certain extent a game, with the cost statement as the score.

A showing of good results also encourages the management to extend the activities of the work. Cost data are particularly valuable to the managing executives of a business, inasmuch as, by pointing out the exact effect of each change, they help those who decide upon such changes to make more intelligent decisions on further changes either in the same or in other operations.

A matter of great importance is the maintenance of a standard of production after it has been set. This is, in fact, absolutely essential in successful efficiency work. All the work of time and motion study and analysis necessary to arrive at a standard, all the education of workmen and all the mechanical improvements which are made in order to make it possible to attain that standard, lose their value almost entirely if they are not followed by that which brings the real result: the constant and continuous production of work on this standard basis.

We have noticed that in most of the few cases of failure of attempted scientific management the cause could be traced to the fact that after the industrial engineer had standardized operations and methods and left the organization, the manage-

ment either through lack of organization or inspiration had not been able to maintain the standards which he had set.

To maintain a standard it is, of course, of first importance to be properly organized, but next in importance, and, in fact, as a part of proper organization, are correct operating cost data.

Conditions in an industrial plant are constantly changing. These changes very often affect the standard production of work. Frequently, and this is the ideal condition, these changes permit of an increased standard. If they do not, the changes should not be allowed to occur.

For this purpose cost information should be complete. It should be clearly classified for comparison with the desired standard. It should be available promptly so that changes which have ill effects and practices which do not tend in the right direction can be stopped at once and before much damage has been done. It should be arranged in such a manner that the factors responsible for the incorrect practices and changes can easily and quickly be detected.

One of the important values of standardization work is that it provides a goal for the worker. Properly collected operating cost data present this goal to the attention of all those interested from the worker up to the highest executive, together with a report or score of accomplishment. It becomes a constant inspiration and infuses an added interest into the work of production.



The mere knowledge of what can be done helps us to do it. It is told of an inexperienced swimmer who entered a race in competition with experts, that he won the race merely because he was told how many strokes a minute it would take to do so. By counting the strokes he made in regular sequence while racing he reached the goal ahead of his competitors. His operating data were an all-important factor because he could compare his accomplishment with the standard required and strive to maintain it. So in business, when we know what can be done and can constantly and continuously compare with it what we are doing through the medium of cost information, we will certainly be inspired to make the actual equal the possible.

All these uses of cost data only show another reason why the management which would be efficient and successful must not only have cost data properly comparable with possible standards, but must permit such comparisons to gain the widest publicity among those in the organization who are responsible for results, so that they may become enthusiastic and inspired and interested in their work to an extent never before possible.



## CHAPTER XXXVII

### USE OF COSTS FOR FINANCIAL PURPOSES

**T**HE CHIEF features with which the financial interests of any business concern themselves are:

1. The provision of money for necessary expenditures for current activities
2. A means of effective accounting for all amounts expended
3. Safe investments for any surplusses.

The first feature is, of course, one which is not very directly affected by costs except to the extent that cases have been known where credits desired have been denied or extended in proportion to the completeness of cost records, which in itself recognized costs as a true measure of good management. It is a fact that banks and financial interests are fast recognizing that in management more is needed to gauge the responsibility of an organization than a mere balance sheet. Costs statements giving more detailed and pertinent facts may often be found a real asset in establishing responsibility.

As to the second feature, that of accounting, we believe it is obvious that the entire value of a cost

plan has been dissipated if it has not been arranged to become a part of the general accounting system. In other words an absolute essential of a cost plan is that it be designed to supply to the general accounts all information so classified and distributed that it accurately ties up with these general accounts.

Cost data which are not verified by this absolute check with the general accounts are worse than worthless since they are not only mere memoranda but also are often very misleading. The financial control of a business should therefore be able to turn to the cost plan for information, properly classified and distributed, pertaining to the operating activities, which it requires for the general accounting, and should in turn be prepared to verify all such statements by checking with the general statements.

Turning to the third responsibility, that of safeguarding investments, we find that cost data if properly planned and used, afford real aid to the financial section of a business, when proposed investments concern either extensions of present activities or additions of new lines of endeavor.

Much has been said in previous chapters regarding the application of the knowledge received from cost data in decisions regarding current investments, and might be repeated when talking of decisions upon proposed general investments as well as of large extensions involving the investment of relatively large amounts of money in which the

financial interests in a business naturally are especially interested.

During the war this phase became one of great importance, when opportunities for large extensions came suddenly and often, but brought doubtful hope of long duration. Here good cost data were especially valuable and proved their importance.

It is worth considering in detail how this information can be used.

Let us consider for a moment the effect of investments on costs. Obviously the first result is increased fixed charges and depreciation to protect these investments.

Before the initial investment in buildings and equipment can be used, other immediate investments are required. For instance, equipment must be installed; miscellaneous benches, bins, trays and other factory furniture must be provided; and power and light must also be furnished.

These additional expenses cannot be considered permanent assets and must be earned during a proportionately short period. There are necessary, of course, additional fixed charges to cover this equipment and these buildings, such as taxes and insurance.

All these items should be taken into consideration in making intelligent decisions as to whether or not investments will prove profitable, and as to what adjustments in prices will be necessary to make them pay. It should be considered whether

or not this equipment and these buildings can be used to the fullest extent during the entire depreciation period, and if not, in how many years they should pay for themselves.

It is also necessary to consider what would be the effect on costs if demand for production dropped off, and the equipment and buildings were forced to remain idle. This, of course, would result in an increase in burden cost on the material which was produced to cover the additional depreciation and fixed charges as well as any part of the installation cost remaining unearned. It is well to consider this possible condition before definitely deciding on investments.

Also it should be remembered that in order to protect himself the manufacturer must, in some cases, receive prices for his product sufficiently large to cover the cost of installation, miscellaneous factory furniture, etc., which cannot be considered permanent assets.

In all these considerations the manufacturer should find operating cost data, covering past performance in his plant, a great help. He should be able to tell from his equipment records the life of equipment similar to that which he contemplates purchasing, and the percentage which should be charged off annually for depreciation. He should know what the insurance and other fixed charges have been, in order to compute what they will be on new equipment. He should be able to estimate from past records what installation,

power, and light charges will be as well as the charges for repairs, maintenance and upkeep.

Again, by referring to his records of production of similar equipment, he should be able to ascertain the effect of all these costs on the total cost and price of the unit of commodity produced, both in the immediate future when using the equipment to its fullest extent, and also at a later date when, under less prosperous business conditions, this equipment might remain partly or wholly idle.



## CHAPTER XXXVIII

### USE OF COSTS FOR PRICING AND SALES

**T**HE AMOUNT of use which is made of operating cost data for determining the price of work done depends to a certain extent upon the nature of the business. Where the market price has been standardized, where the article manufactured has been standardized as regards specifications with a recognized value and price, or where the product is of unequalled quality or kind and is so desirable that an unusual margin of profit can be secured, it will usually be found that little use, if any, is made of cost data in fixing the price of the product or material when sold.

Although many manufacturers producing articles which do not come within the classifications mentioned have come to recognize the fact that the only conservative method of putting a price on material sold is upon the sound basis of the cost of production, there are still great numbers who do not as yet fully realize that this is one of the important advantages to be secured from the collection of operating cost data.

Many may still be found who, in order to price



an article, add the gross cost of material used to an estimated cost of labor applied, and to this, beside the profit desired an arbitrary figure to cover all other expenses. This figure perhaps had for its only justification the fact that a competitor had been known to use it, or that it was once found to be correct and is therefore assumed to be right under all circumstances. Unfortunately, too, this figure, especially where there is much competition, is very much less than it should be, and rarely will it be found to more than cover the actual cost.

Two very important facts are not recognized when prices are fixed in this manner. The first is that no two factories have conditions exactly similar or expenses exactly alike; the second, that conditions are always changing in the same factory.

There are so many different factors which enter into the cost, such as location with reference to source of supply, kind and age of machinery and equipment used, power used, ability of concern to obtain and keep efficient workmen, maximum producing capacity, and many others, that it is difficult to imagine two producing plants even under the same management where all these factors would be identical and where consequently the costs would be exactly the same.

In one plant electric current may cost five times as much for the production of the same number of units as it does in another where equipment is more modern and requires less driving power. A

foreman at fifty dollars a week may supervise the manufacture of twenty-five units as a maximum production in one plant, or an average cost of two dollars per unit, while next door the same priced man may be supervising the manufacture of fifty units at an average rate of one dollar per unit. It is, therefore, safe to say that in all cases the other man's figures and prices are uncertain and unsafe, and that prices based on costs collected in your own plant covering your own conditions are the only kind which will withstand the test of time.

Few manufacturers realize how rapidly and often conditions change in their factories. A slight change in method, machine or men may have a far-reaching effect on the cost of production. A lot of raw material difficult to process may be accountable for a cost this week which is double that which was found to be correct last week. Salaries and wages are constantly changing, usually increasing, and corresponding changes must occur in costs, unless production varies in exactly the same proportion, which is rarely the case.

Even if all expenses and total costs remained the same, which they rarely do, production must vary in almost all cases from time to time. It is difficult to realize how far-reaching and quick is the effect on the unit cost of a changed production with a stationary expense. A burden cost of one hundred dollars on a production of twenty-five units would average four dollars per unit; should this produc-

tion drop but twenty per cent, which is not at all an unusual circumstance, the unit cost would increase to five dollars—an increase of twenty-five per cent.

It will usually be found that while direct expenses, such as direct labor and materials, can be regulated with production, burden cannot be varied nearly so consistently. In most cases it will be noticed that burden expenses reduce at a slower rate than production. This is probably due to the fact that such reductions are not made immediately, but are put off until it is absolutely necessary because it is hoped until the last that production will soon be up to normal.

Because of the many changes which occur in the average plant and so rapidly and vitally affect costs, prices should not be based entirely upon costs once secured from actual conditions, but from costs collected currently or at least as often as changes which would in any way affect them occur.

We fully appreciate that it would be impractical to attempt to change prices each and every time a change in cost occurs, and we do not recommend such a procedure, but we believe that comparisons should be made so that any important increases in cost can be rectified and reduced, or if this is impossible, at least seen in their true relation to decreased future profits or an increased selling price. If the changes in costs are reductions and are consistent, it may often be found advisable to reduce the price accordingly, and thereby develop

strength in competition and secure a larger volume of business. We believe that in many cases manufacturers owe it to their customers and to the public, to know of reductions in cost and give the buyers a share in the benefits of such reductions just as soon as they can consistently do so.

Two things which are essentials in cost data used in fixing prices are:

1. That the cost be complete and include all items
2. That this cost be available as soon after the work is completed as it is possible to collect it.

When we find quotations on a given piece of work varying from a certain price to several times that price, when we note that in many cases among many bids received on work no two even approach similarity, and when we find competitors cutting each other's and their own prices even as much as fifty per cent of the original and lowest quotations, we must conclude that one of three things is accountable.

Either the low bidders are working under very modern and standardized conditions, while the higher ones are still operating with obsolete equipment and methods; or they do not have any accurate knowledge as to operating costs, or do not use what data they have in estimating prices of work to be done; or, last and worst of all, some of the bidders are maliciously cutting prices even below costs, with a knowledge of actual costs, in



order to keep the business away from certain competitors with the hope that this may ultimately drive them out of the field.

The first condition is one which is being steadily corrected, but it is a long process to standardize all organizations in even one industry, and while it is to be heartily encouraged and has for one of its most essential features accurate cost data, we must turn for a more immediate remedy of this industrial evil to the correction of the second, and without doubt most frequent cause, the ignorance of correct cost data or the neglect to use it in estimating work. It may be well to mention here that the collection of correct operating cost data, particularly when used for estimating work where it is possible to compare with competitors' prices, will point out inefficiencies and will often bring about the standardization of operations, the purchase of modern machinery and the development of higher efficiency in an industry.

In order that cost data may be used intelligently for estimating on prospective work they must be available. Quotations and bids must be made promptly. There is no time, as a rule, to search through a great mass of information for a specific figure. It must be easily accessible.

This information should be collected according to orders, contracts or lots completed, and be sufficiently described to make possible ready recognition of just what kind of work it covers. If this complete description is impossible or not advisable,

reference to other sources should be provided so that it can be secured easily.

As often as possible these cost records should be classified under each order, contract or lot as to operations, machines or men, as well as various classes of costs. This is useful where it is found that no previous case exactly covers the prospective job, inasmuch as it may be possible to choose from the records of several previous orders, part from each one, information adequate to make a close estimate on the cost of the new class of work to be done.

It is also well to record the efficiency at which the operation or operations on an order were performed, wherever it is measurable. It may be of assistance in quoting on work if past or present efficiency can be compared with possible future efficiency.

Above all, data must be complete, for partially complete data are worse than no data at all.

Where information has been collected on a large enough number of orders, contracts and lots and been properly classified as to operations, men, machines and various kinds of costs, charts, graphs, data sheets and price sheets can be developed to put the information in shape for ready, immediate and rapid reference. This is most advisable just as soon as it is possible.



## CHAPTER XXXIX

### THE EFFECT OF COST DATA ON THE LABOR PROBLEM

**C**OSTS HAVE for too long a time been considered, and as a matter of fact have been used, merely as historical records or as lifeless accounting systems. It is urgent that they be recognized and used to their fullest extent as an influence in managerial decision, as a basis for intelligent control of all factors pertaining to production. And as an outstanding factor in production we come naturally to labor, the workers in the plant, and to a consideration of the influence of cost data upon this important group which represents a problem of ever-increasing importance, and one which strange to say, with all our studies, researches, analyses and discussions we are barely beginning to understand.

The use or lack of good cost data influences the labor problem very definitely both directly and indirectly.

Every manager, superintendent and foreman over large or small groups is called upon daily to make decisions regarding the workers. He must decide which men and how many men to employ,

which to promote, how to assign them to work, what their various wage rates, increases, and relative value as they progress in the ranks must be. They must decide as to the effect of wage rates upon production costs, and burden percentages.

During prosperous conditions decisions must be made as to the employment of larger forces, working extra hours, shifting of working forces and redistribution of men to larger opportunities. During less prosperous conditions decisions must be carefully made as to reduction and redistribution of forces, change in working hours, reassignment of workers and change of wage rates.

Each and every one of these decisions has a real bearing upon the development of proper relationships with the workers in an organization. The reactions of the workers toward management and employers are molded, sometimes gradually, by a succession of such decisions, or in one fell swoop by a single outstanding exhibition of judgment of this class. These are the direct influences upon the labor problem.

With the best information available these decisions are none too easily made, and without reliable detailed data for guidance they come hopelessly near being a guess in the dark, sometimes fair, often very unfair, to the workers in the plant.

With all our great industrial progress in this country there still remains an overwhelmingly large group of managers who continue to follow the line of least resistance, refuse to secure reliable data

as a basis for judgment, or fail to recognize the value of analysis of the facts these data portray in making decisions. These managers wonder why labor is not satisfied when developments indicate mistaken judgment or even unfair treatment on the part of the management.

More hopeless is the type of management which accepts all these problems as entirely controlled by chance or outside influences, and does not take personal responsibility for their solution. In making their decisions such managements are largely guided simply by what others do, and usually do only what they must to fulfill the urgent demands of labor, with little real knowledge of the effect of their action.

We cannot emphasize too strongly that every decision having a direct influence on the relationships of labor should be made with a knowledge secured from an analysis of reliable cost data, prophetic as well as historical, pertaining to each and every related item of cost which will be affected by such decisions. Then, if decisions of any sort are forced or become politic, or because of some uncontrollable influence seem necessary even in opposition to better judgment, they are made with eyes wide open, and with a sane foresight of future moves. Even if occasionally such a decision does not turn out to be the most effectual, there should be satisfaction in the thought that everything possible had been done to fulfill a responsibility.

Our comprehension of a proper cost plan is one which includes a record of all labor cost data so classified as to offer a continuous fund of information as to individual workers, groups of workers, departments, direct labor, and burden labor, which traces such costs back to their origination, and fixes responsibility for it and compares and proportions each cost to the results secured from it to show as far as possible the positive value of every item of the labor factor to the production program as a whole.

With such information available and used the manager no longer works in the dark. He ordinarily need not guess, and knowledge minimizes the proportion of arbitrary decisions and the chances for unfairness.

It is logical that a manager of men can pass better judgment on problems pertaining to them if he has comparative data available. For instance, the individual value of a single worker, which must in the end be decided on a basis of individual effort regardless of propaganda to the contrary in favor of rates of wages by classes, can certainly be more satisfactorily adjusted by an analysis of records showing comparisons of the worker's productivity at various stages, as indicated by operation and unit costs of the particular worker's productivity with that of others in the same class, and of costs of his operations with those of other operations. Better judgment can certainly be applied to the much-needed solution of the problem

of adjusting base wage rates for various classes of labor in a given industry. This alone has a distinct effect on labor relationships as was pointed out emphatically in the wage adjustments of the ship yard workers; if well-classified costs are available showing relative importance of each class of labor to the total unit costs, the margin available for such adjustments can be fairly determined.

It requires very little imagination to find dozens of other problems involving relationships with the workers wherein the solutions require a knowledge securable only from well-classified comparative labor costs. Space will not permit a complete analysis of the extent of these problems, but it is hoped merely to suggest enough of them to inspire the application of cost knowledge to the solution of these or similar problems as they may arise.

Aside from the decisions which directly influence the present welfare and future development of the workers, let us consider the indirect influence brought to bear by decisions which concern other factors in production and have an indirect effect upon the workers.

Every worker, other things being equal, prefers to work for a prosperous concern. Take for instance the question of selling prices where the costs can properly affect these prices: if they are blindly established without true costs as a basis and the prices are set so high as to result in a loss of volume or so low as to operate at a very low margin or even a loss, has not the result affected the labor



problem again? The worker is not certain of his job, he has no assurance of a future, his promotion is forced.

Take, for instance, working conditions, which we know without doubt are a real influence upon the worker's reactions. How are they influenced by the use or lack of proper cost data? Briefly in this wise: the manager of a rapidly growing plant can most effectively plan his extensions with good data as a basis for judgment. He can avoid the Topsy type of plant that "just growed." He can establish reserves for plant improvements, extensions and maintenance, analyzing just how much his business at various stages will stand for such expenditures, and can often make adjustments so that little less than the best will be provided for the workers' comforts and full productivity.

Through proper depreciation of equipment and proper control he can provide equipment for his workers which will make them satisfied operators with a real pride in their operation.

Through the use, for control purposes, of cost records pertaining to materials both direct and indirect he can educate his workers to a realization of values which will create a new interest in their work, and give them that sense of responsibility which has never failed to develop better men.

Through his use of the cost data for control and reduction of burden, he can establish a service, supervision, training and maintenance for his workers never before possible. He will in many



cases be able to apply savings to greater and more effective service to the workers.

Here again we have only indicated the high spots of cost usage. A detailed analysis will show the manager no end of further opportunities.

It is not surprising to find how many times a satisfactory labor relationship goes hand in hand with well-developed cost and production records, and vice versa, how often, in fact how almost always, the grumbling and dissatisfied groups will be found in the plants where little control of costs or production is available or used.

There are, of course, many other features which affect labor, and many more things to learn about workers than about labor costs, but we venture to say that a real step toward a better understanding will have been taken when labor is managed with more definite knowledge of costs and relative productivity as a basis for decisions and judgment.

## CHAPTER XL

### GETTING THE CO-OPERATIVE SPIRIT THROUGH COSTS

**A**LWAYS and ever the spirit of any group of men is merely a reflection of that of their leader. Find the manager of men who is alert, progressive, a student, a careful judge, a keen analyst and a sound economist and you will find under him a group of interested, co-operative workers.

To those who complain of the difficulty of getting labor to co-operate we have but one suggestion: teach them *how* to co-operate. Educate them as to what is required of them, tell them their part in the whole program, outline to them their responsibility—appeal to their pride, and you cannot help but stimulate their interest. It is but human to respond to such appeals and responsibilities.

But unfortunately those who should educate their workers along these lines are often not themselves educated. In many cases they do not know what to ask of workers, what to expect of them.

Education is needed, and not only and not primarily of workers, but first of the great army of

executives, managers and foremen who handle labor. They must be educated, first to the value of data as a basis for decision, next to the type of data required, and finally to the use of them.

We hear much of Americanization of foreigners in the ranks of workers. Surely this is a worthy move and should be well supported, but what an immense task is ahead of us in the education of both American and English speaking workers to be good co-operative partners in manufacturing enterprises, and first of all, in the education of the managers of men as to what to require and how to attain it.

And in all this educational work, costs of the proper sort, correctly applied and published, are the real factors. There is no other measure of results which is so influential as tell-tale figures in dollars and cents. Nothing will teach management how to manage so effectually as this measure of management itself. Nothing will teach the workers how to co-operate so effectually as information which shows the effect of such co-operation or the lack of it. Why do men rise in organizations faster and faster as they go up into higher responsibilities? Because as they rise they become more and more intimate with the relationship and value of their efforts to the whole; in other words, learn to co-operate. They attain a sense of proportion and of the fitness of things. These are the lessons which every worker must be taught. Costs are a firm basis for this education.

The management, each and every day influences the spirit of every worker high or low in the organization, by its knowledge of costs and its application of this knowledge.

Let us consider, for instance, normal conditions. If the management itself has not taken proper steps to know more than the wages paid a worker, and has little or no data regarding the proportionate productive return for such money, is it not natural that the workers should also think only in terms of wages? If the worker has not been offered any standards or objectives will he not be justified in establishing his own?

If employers continue insistently to accept labor merely as a commodity, to be purchased in terms of hours alone, can it be expected that labor will offer itself in any other terms or strive to give anything more than hours in return for wages?

In co-operation there must be a known, tangible, common objective; if little is known about relative performances, or the influence of costs, little or nothing can be done to establish such a common objective for both employer and employee.

Just so long as managers know little about true costs and fail to tell labor the little they do know, just so long will there be difficulty in securing the co-operative spirit. There must be established a more satisfactory common ground between capital and labor. They must learn to speak a common language of values, interpreted in terms of costs of productive effort and relation between perform-

ance and reward. Employers must learn this language themselves, through proper costs, and then must take steps to teach it to their employees. A large task, to be sure, but the only solid foundation for the establishment of proper relationships; a worthy objective indeed for several generations of work.

If under prosperous conditions and pressure for production the manager without the aid of cost information as a guide carelessly spends money depending upon it alone for results, can it be expected that the workers will have any great appreciation for the dollar? And since the dollar he directly affects is the wages he receives, it is but natural that he thinks only in terms of getting "his," and not in terms of the time he spends which represents to the employer the dollar he controls.

If the management has no control of materials, no definite policy based on cold facts regarding their use; if in other words there is no outstanding indication of proportionate values of the materials handled by the worker, shall it be expected that he will of his own accord go out of his way to conserve them? They do not even represent values to him, until definitely expressed as such to him.

Teach the worker values, economic relationship, productive ratios, all as portrayed by proper cost data and you will soon teach him how to co-operate.

Then when the dull period comes and retrenchments must follow, if the executive tells little or

---



nothing definite as to the effect upon labor, either because he has little to base his judgment upon or fails to apply what little he has in the broadest sense, and keeps everyone in the dark until the moment when he arbitrarily makes the cuts which affect the worker, can he expect any spirit of co-operative retrenchment? Not knowing conditions, having no appreciation of effect, no knowledge of relative values, the worker can only hang on as long as possible, making each job last, waiting the impending blow with resentment against the man or group of men—the employers whom he cannot help but blame for his misfortune.

If, on the other hand, with prophetic cost figures as a basis and a guide, the employer establishes a definite program of retrenchment, takes every member of his organization into his confidence, lays all facts before them and shows them his conclusions, it is logical enough that from self-preservation alone the workers will strive to co-operate to protect their own interests. If in the end they sustain individual losses they do so more willingly with a knowledge that all had been done to prevent them that could be done, and that they themselves had a hand in it and were at least partly responsible.

There is need of a wide campaign of education in practical economics in this country, economics taught very differently than in the past. Economics must be recognized as the acts of men as individuals and groups, which affect the production



and distribution of the wealth of the country. Too long has this been recognized as solely controlled by financial laws and regulations through the manipulations of large investors and capitalists. It is true, of course, that these have a very large influence, but the last several years have proved beyond all doubt that the individual workers by their effect on production, its use and distribution exert a definite influence upon all phases of economics.

In his daily production, purchase and consumption every person, through the policies, judgment and intelligence applied in such acts, establishes economic conditions. In other words it is not the number of dollars which controls our economic conditions, but the value of these dollars, the amount of product they represent and the way this product is produced and used. This involves every man.

Costs properly developed become a picture of the effect, proportionate relationships, and probable future influence of all these acts of individuals and groups. The establishment of proper costs and the education of all concerned in their proper use will do much to develop the much needed understanding of practical economics in this country.

We do not advocate an attempt to teach every worker all the intricacies and complications of cost accounting—it is difficult enough to accomplish this education with the executives who must know

them—but we do believe that every worker should be taught to understand the relative costs of all features which he definitely affects by his own individual acts. This is the minimum of cost education necessary to secure the co-operative spirit. It is but a start toward the development of a sound economic condition in industry and the country as a whole.

## CHAPTER XLI

### FORMS

**I**T PROBABLY seems strange to many readers that the subject of forms has been left for consideration until near the end in a discussion of costs, that reproductions of forms are not included in this volume, and that the pages are not more or less profusely illustrated with descriptions of forms in use or proposed. This omission has been intentional. While forms are a distinct necessity as tools and mechanisms in the development of proper cost records, detailed and specific forms should never be allowed to confuse the issue of the correct principles and philosophy underlying the cost plan itself.

In the past we believe the study of cost methods has been centered too often around specific sets of cost forms of various sorts. Too often the tail has been allowed to wag the dog, and the forms, being tangible, have been described at length while losing sight of the principles which they served to apply. Many of our volumes on costs have been series of descriptions of the use of forms intended to be suggestive for similar application.

Even at this late writing there is in existence at least one organization which attempts to sell a set of forms pretended to be a complete factory cost system.

If there has been any one thing which more than all others has retarded the progress of true costing, it is this too concentrated study and application of forms.

In many cases forms in use by one company have been secured by another which attempted to install them in its own business with very little modification. Very little comparison of the conditions and circumstances under which they were used was indulged in. Little or no consideration was given to the principles which the particular forms aimed to apply, and less, to whether or not the same principles could or should be applied in the case in hand. In fact it was considered a feat to have secured the entire forms of a company whose cost methods were considered good. Forms were guarded carefully, to keep them from falling into the hands of competitors, so important were they considered.

Unfortunately in so many instances where sets of forms were transposed in toto in an attempt to install a cost system, the failure of the misapplied forms was charged up as a failure of the principle of good costing, and condemned all cost keeping as impractical, or even impossible.

It is encouraging to see a gradual change in this state of affairs and to find a greater interest in laws

and principles. We find trade organizations openly comparing and exchanging forms. And why should they not, as they would use a common piece of equipment, a tool which was standard for the trade?

All this does not mean that forms do not deserve attention, or that they have suffered from this apparent lack of interest. On the contrary this more open comparison and exchange, the recognition of forms as a tool, has had a tendency to standardize them and hence to bring about their real improvement.

Forms as tools and mechanisms in their proper relationship to costs are deserving of much study. As a matter of fact in all probability a volume larger than this could be written on the subject of forms alone and it would be a worthy task.

Even with sound principles and philosophy in mind, forms may easily spoil the entire application of cost keeping. They may cause that condition, so dreaded in methods and systems, commonly known as "red tape." They are therefore the important step between the cost principle itself and its ultimate application.

After the entire cost plan has been decided upon and outlined and the time has come to choose mechanisms and design forms, it is advisable to consider several important features as follows:

1. The information desired, classified as to its source

2. The route over which this information must travel while used and until finally filed away
3. The individuals who must be depended upon for the information
4. The individuals who will use it
5. The relative importance of the various items as regards use, promptness required, accuracy needed, and descriptive detail wanted
6. The relative importance in the final result of each item of information needed.

With all these features well in mind, the forms themselves can easily be designed. Sample forms may be used for guidance at this stage but should not be allowed to exert too great an influence.

The forms should be designed so that they provide for recording all the required information but no more. Many extra spaces, miscellaneous columns and lines without specific purpose are only confusing and cause extra effort not only in filling out the forms but in using, tabulating and filing the records.

Forms should be designed so that only the minimum amount of effort is expended in their use. This is effected in the first place by carefully arranging each form so that as far as possible it will bring forward all information needed regarding any element at one time. Arranging the route the form travels for the collection of data in proper sequence, eliminating the retracing of steps as far as possible will effect this. The arrangement of



forms so that a number of copies of the same form can be filled out at the same time, in some cases two or more forms at one time, will influence their practicability and the amount of effort required.

But here it is well to sound a warning. It is easy to go to extremes in devising ingenious systems. After all, simplicity is a real virtue and it pays well. It is always absolutely necessary to keep in mind the intelligence of the individuals who are to be required to fill out, handle and use these forms. Not only their intelligence but their time must be considered; the more intelligent the worker the more valuable his time. Therefore the form must be designed so that it can be easily filled out by the clerks available, and is not so complex that it requires an intelligence to handle it out of all proportion to the available personnel and to the results of its use.

Then, too, the forms will greatly influence the use of the data. Many beautifully printed forms have been known to fail ignominiously in their mission because they involved too much study and were altogether too complex for effective use. The relation of this to the existing and available personnel must also be well considered.

The size of forms is a matter of considerable importance. First the size influences economy in the forms themselves. They must waste no space and yet they must not be so small that they are inconvenient to fill in or use. They should be of a size that will cut economically from standard paper sizes.

The size and shape are very important as they relate to binding and filing. It should be arranged to bind forms in economical and accessible standard filing equipment to facilitate their use. Large, clumsy binders are a hindrance to good record keeping and should be avoided.

Colors of papers and of inks used in printing and ruling are important. They facilitate sorting, and the use of some copies separate from others. Certain colors of papers and inks and combinations of the two facilitate reading and are therefore especially desirable.

The arrangement and rulings of the forms are items of great importance. Here consideration should be given to arranging spaces for important items in their proper positions for quick reference and use, to proper positioning of various spaces in proper relationship to others, in order to facilitate addition, subtraction or multiplication of items, to proper positioning of index, reference or file data for speedy use and the arrangement of items in logical sequence in order for quick use and recording. The arrangement must also allow as little doubt as possible as to what is required and how it is to be recorded and used.

The quality and texture of paper is also important. Heavy paper should be provided for plant use and for forms used often and much, thin papers for duplicating forms to insure good legible copies and good quality paper on important forms to be preserved for long periods.

Printing and type faces are worthy of thorough consideration. Good, practical, easily read printing is an asset on all forms, facilitating and often inviting their use. It is desirable if possible to standardize on the type.

It is well to try out forms by using a few duplicated copies before the printing is ordered. Then, as soon as all experimenting is finished, should come standardization of the forms and methods, to permit of ordering printing in large quantities.

In the development of forms there is a tendency to provide more numerous and more difficult kinds than necessary and often too many duplicates of a given form. Study will often point this out. We are reminded of one case where four copies were reduced to three, then later to two, although the form with four copies had been used in hundreds of thousands for years. Another study showed that one form could do more than the work of three. In another case twenty-one forms were reduced to eleven for the same work. In another case a costly printing job was eliminated because it was found that forms that were seldom used could be more economically ruled by hand. In one organization where upwards of four hundred forms were used study and standardization eliminated over thirty per cent.

A rigid policy in regard to changes of design of forms should be established. This is almost as important in a cost system as changes in design of a machine in a machine shop. Many good cost

systems have become entirely demoralized through arbitrary and careless change of forms. Before a form once standardized and accepted is changed, approval should be required from a chief coordinating executive, the higher the better, who should approve only after conferring with all individuals involved in the filling out and use of the forms. A change which may facilitate matters in one department or for one individual may easily handicap any number of other departments or individuals. Changes should be discouraged and allowed but infrequently. Changes often affect the entire cost routine and may in the end result in an entire change in the final results secured.

It is advisable to review all forms periodically to make sure that they are being used to fullest advantage, to eliminate dead timber, to ascertain why certain ones are not being used, and to provide for any improvements possible. This may be done twice a year.

Remember that although forms have no direct bearing on the particular principles and philosophy applied in costing, they are important in their application

## CHAPTER XLII

### COST TESTS

**E**VERY cost system should be able to fulfill certain tests to prove its worth. Outstanding in these tests, in fact so important as to be almost alone in its class, is the one test—use. Are the records really used to their fullest advantage? Does every item mean something to some one in the organization? Are all the statements in reality mechanisms, or mediums of control in the hands of the proper individuals?

There is no excuse for the existence of a single item of information, for the collection and tabulation of a single figure, for the detailed description of even one item of expense, if the result is not used.

Our main test then is use. It would be preferable by all means to have a dozen main items of cost data constantly referred to, in statements thumb-marked and torn, than to have volumes of detailed data, beautifully printed, bound and indexed never referred to for use, but opened only to exhibit the style and beauty of the records themselves.

It should be noted that the test imposed is *use*



and not usefulness. Many useful costs are not used, while of course many costs would be used if they were useful or usable. This brings into consideration two factors which must be considered. First, the methods, systems and data and second the personnel for whom they are developed. It is not only important to have cost data which *could* be used, but it is also important that the data be such by its nature and arrangement that it *will* be used by the particular individuals who should use it.

This brings us to an important consideration which is often overlooked. Some executives abhor detailed data, they resent the necessity of long analytical statements, they have no patience or time for long tabulations or comparative figures. They are interested in and will use striking and emphatic comparisons and important items outstanding in glaring colors. For them data should be carefully arranged so that it will demand their attention. Here, particularly, graphic presentation should be applied. It particularly appeals to this type of executive. He will use data emphatically visualized, will pay attention to information which can be quickly and easily assimilated at a glance.

Probably this type of executive is the more modern and at present the prevailing type, and this no doubt accounts for the popularity of graphical presentation of costs. But there still remains the executive who prefers to use detailed,

long-drawn-out, tabulated statements of costs. He prefers to study the individual items, to follow them then into their respective totals and gradually but surely to grasp the picture. He is glad to devote this time to the study and finds satisfaction in his complete familiarity with every detailed item. While this is not always to be encouraged as most effective management, it is by all means desirable to furnish him the data in the form he prefers, rather than to discourage use of data at all through a presentation which does not properly feed his detailed mind.

Here we have another excellent reason which would alone be sufficient were there no other, for designing each cost method particularly for the given case; always using a made-to-order system and never the ready-made plans which sometimes are considered. The plan should be outlined particularly for each case so that it will not only be useful but used.

There are other tests, all of which influence the use to a marked degree. Let us consider some of them. All data must be accurate if they are to be used. A single error will cause an executive to lose confidence in the cost statement; he will discount it and soon be discouraged from using it. All items should be verified so that results can be proved, and be properly supported by authentic records.

The presentation should be practical if it is to be used by the busy executive. He has very little

time or interest as a rule in experimental, theoretical analysis. He will use straight-forward common-sense data, called by their right names. He wants no fancy nomenclature, no theoretical "isms." He does not care to guess at the meaning of any of them. Practical simplicity will hold his attention.

Probably nothing is more important than truthfulness. Distorted figures soon lose the executive's interest. Fine showings which careful analysis easily discounts, or at least questions, are never worth while. The truth should be the very backbone of the cost statement; its daily use is more sure if it is reliable and authentic.

The need of truth is one of the reasons for another desirable feature—completeness. The truth can often be hidden by leaving out certain items. The presentation should be complete or it is soon doubted. Even true facts can often be questioned for want of complete supporting details. If the executive who is being interested in the cost statements looks for certain data to make his study complete and does not find them, he quickly becomes discouraged.

Then too to encourage actual use, the records must alway be intelligent. Executives should not be required to ferret out ambiguous meanings. They have no time to puzzle out meanings of descriptions but want them intelligently expressed in understandable terms.

The next qualification has often been suggested

and is well established. It is promptness in presentation of cost data in order to facilitate use. We are all much more interested in current than in ancient history. The executive thinks in terms of today. He would a great deal rather look forward than backward. He reads today's newspaper but seldom reads one several weeks old. Other arguments for immediate records to facilitate effective use have been repeatedly given.

Another feature which has an influence on the use of cost data is the extent to which it is clearly defined. Just as an organization plan should draw definite lines of authority and responsibility, so the cost chart should be clearly defined so that each executive may understand without a single doubt just how far he is held responsible and therefore to which features he must apply his especial attention. Someone accountable for every item, and keenly aware of this responsibility is the aim of the good cost system.

The value to be secured from the use of cost data does not come from application for a day or a week or a month. The real results are established after months and years of use. Therefore it is important that the cost presentation be standardized as soon as possible so that the results can be consistently used in exactly the same manner, month after month. After an executive has established a plan and policy for the use of cost data, it will discourage him beyond remedy if the method of presentation is changed or rearranged.

This brings out the last essential qualification to encourage the proper use of costs—permanency. The executive will have no patience with data which this month tell him certain things under one heading and the next month under another heading or not at all. Permanency is absolutely essential to prompt and easy comparison which is the very foundation of use of this information. Changes should be made only when urgently advisable, and then only with complete understanding and approbation of all concerned. It is far better to have well established, permanent records, even though they have certain faults, continuously and consistently in use, than to have ever changing theoretically correct records, available but not used because they require new understanding and application each month.



















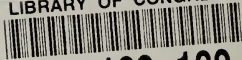


MAR



N. MANCHESTER,  
INDIANA 46962

LIBRARY OF CONGRESS



0 021 183 182 0